01-0855

GE
159 Plastics Avenue
Pittsfield, MA 01201
USA

Transmitted Via FedEx

June 15, 2005

Mr. James DiLorenzo
United States Environmental Protection Agency
EPA New England
One Congress Street, Suite 1100
Boston, MA 02114-2023

Re: GE-Pittsfield/Housatonic River Site
Building 71 and Hill 78 On-Plant Consolidation Areas (GECD200)
2005 Construction/Consolidation Activities

Dear Mr. DiLorenzo:

I. Introduction

This letter summarizes the 2005 construction and consolidation activities anticipated to be conducted by the General Electric Company (GE) related to its Building 71 and Hill 78 On-Plant Consolidation Areas (OPCAs). As discussed herein, the anticipated activities include the construction of the final portion of the Building 71 OPCA baseliner as well as the consolidation in the OPCAs of materials to be generated by remediation and demolition activities performed this year. In general, the construction and consolidation activities described in this letter (and attachments) will be consistent with activities that have been performed by GE over the last five years. Such activities will generally be conducted in accordance with the June 1999 *Detailed Work Plan for On-Plant Consolidation Areas* (Work Plan); August 1999 *Addendum to June 1999 Detailed Work Plan*; GE's June 13, 2000 *Response to April 27, 2000 EPA Comments*; the United States Environmental Protection Agency's (EPA's) January 30, 2001 *final conditional approval* letter; and GE's March 9, 2001 letter response to *EPA Conditions for Approval of OPCA Work Plan*. In addition, site construction activities will be performed consistent with applicable requirements included in the June 2003 Project Operations Plan, and any subsequent revisions (e.g., air monitoring, quality assurance testing, etc.).

As discussed in the EPA's January 30, 2001 conditional approval and GE's subsequent March 9, 2001 letter, technical information related to the 2005 Building 71 OPCA expansion (i.e., technical drawings and specifications, etc.) is being provided for EPA review and approval. The Building 71 and Hill 78 OPCA consolidation information presented in this letter is provided for informational purposes only.

The remainder of this letter presents an overview of the anticipated 2005 OPCA construction/expansion activities, the consolidation activities planned for each OPCA, and the anticipated implementation schedule for both the construction and consolidation activities.

II. Construction/Expansion Activities

In anticipation of future near-term consolidation activities to be conducted at the OPCAs, GE will construct the remaining portion of the Building 71 OPCA baseliner (referred to as Cell 3). The lined portion of Cell 3 (i.e., the portion available for material consolidation) will be approximately 1.4 acres in size and constructed between the western edge of Cell 2 of the Building 71 OPCA and the eastern slope of the Hill 78 OPCA. The Cell 3 baseliner will contain the same components as the existing Building 71 OPCA: a six-inch-thick soil sub-base layer; a 60-mil textured HDPE liner; and a geosynthetic drainage composite. The baseliner has been designed to maintain a minimum 2% slope toward the leachate collection system and a minimum 0.5% slope along the leachate collection pipes. While the Cell 3 baseliner system components will be permanently attached to the existing baseliner system, the leachate collection system for the new cell will be isolated from the existing system until such time that material consolidation in the new cell is initiated. In the interim, precipitation collected in Cell 3 will be contained with periodic discharge to the bordering drainage ditch using portable pumps. Specific construction details (technical drawings) related to the Building 71 OPCA expansion is provided in Attachment 1 to this letter. Attachment 2 to this letter includes the project technical specifications, which present specific requirements for material installation, earthwork activities, erosion control, and site restoration related to the construction of Cell 3.

The majority of the engineering calculations associated with OPCA development activities were prepared previously during the development of the Work Plan and have been submitted and conditionally approved by EPA. Certain additional engineering calculations related to the first OPCA expansion in 2002 (Cell 2 construction) were subsequently submitted to EPA in a letter dated March 27, 2002. Those calculations were conditionally approved by EPA in a May 28, 2002 letter. As discussed in the March 27, 2002 letter, construction activities related to expansion activities generally consist of extending previously-designed and constructed site features (e.g., berms, ditches and pipes). The Cell 3 construction activities consist of extending the same site features, therefore, the engineering calculations previously submitted and conditionally approved by EPA are also applicable to the design and construction activities for Cell 3. No other engineering calculations are necessary for EPA to review.

III. Consolidation Activities

In 2005, GE anticipates that several thousand cubic yards of material will be consolidated at the Hill 78 and Building 71 OPCAs. These consolidation materials are anticipated to consist of soils generated by GE relating to the Phase 3 Floodplain Properties and from the Newell Street Area I (NSA I) and NSA II Removal Action Areas; soils and sediments generated by EPA relating to the 1½-Mile Reach Removal Action; and building demolition debris associated with Brownfields-related activities from the areas of the GE Plant to be transferred to the Pittsfield Economic Development Authority.

The consolidation materials will be placed within the OPCAs consistent with the technical drawings presented in the Work Plan and subsequent correspondence. At this time it is anticipated that a portion of the Building 71 OPCA will reach its design capacity in 2005. As a result, GE is finalizing the technical design for installing final cover over that portion of the Building 71 OPCA that has reached its final design configuration. GE will submit the technical information related to the installation of the final cover at the Building 71 OPCA within the next couple of weeks (approximately July 1, 2005). Construction of the final cover is anticipated to commence in mid-August of this year.

IV. Anticipated Schedule

At the present time, GE anticipates that the construction/expansion activities associated with Cell 3, as well as the final cover installation activities at the Building 71 OPCA, will start in mid-July and be completed by November 1, 2005. Consolidation activities will be performed throughout the year, with the frequency and duration of the events contingent upon the amount of consolidation materials generated. However, regardless of the number of placement periods, the consolidation activities for 2005 are expected to be completed by end of this year, unless weather conditions allow extended consolidation activities through the winter months.

Sincerely,

John F. Novotny /jic

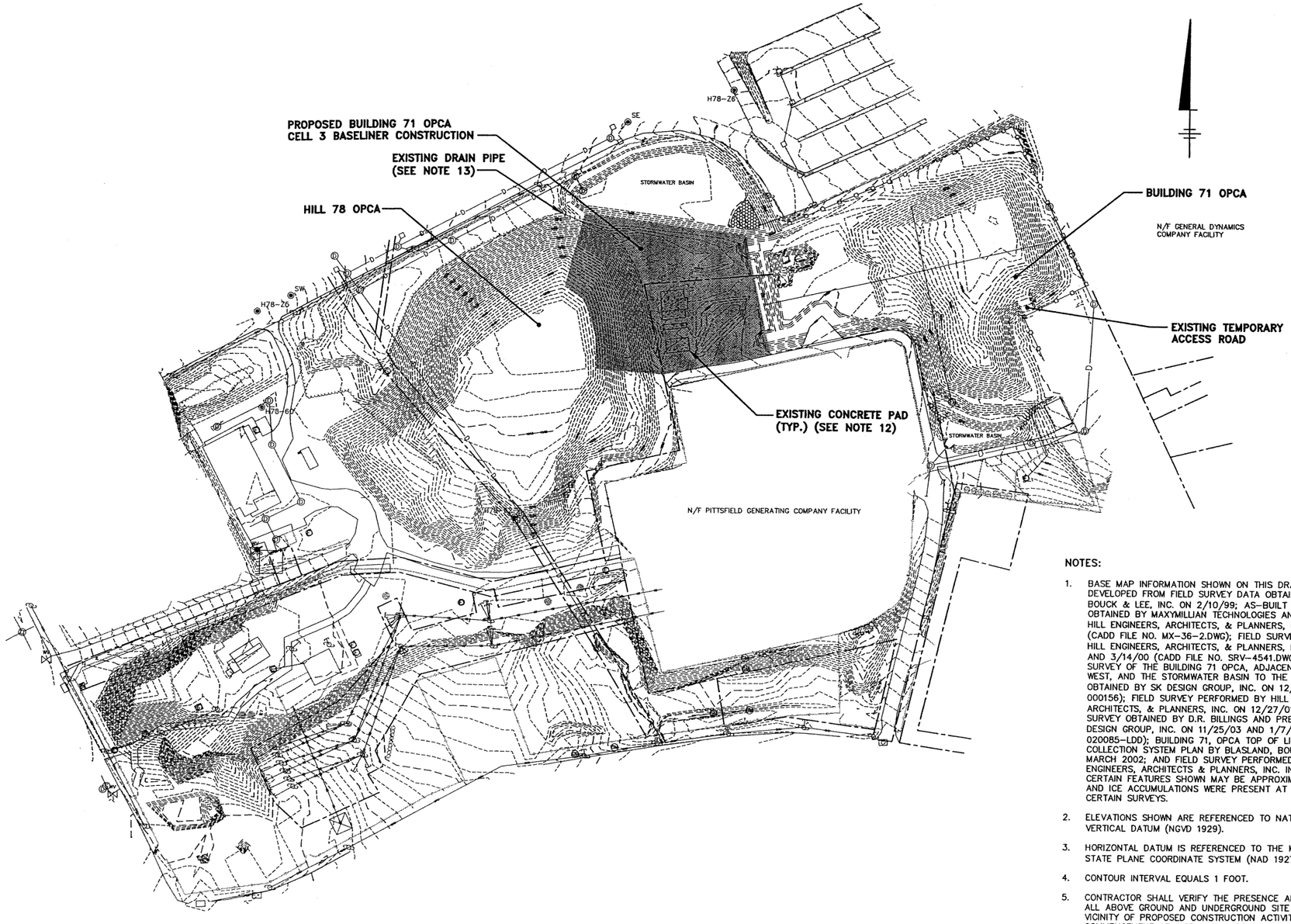
John F. Novotny, P.E.
Manager, Facilities and Brownfields Programs

CAA/ams
Attachments

cc: Dean Tagliaferro, EPA
Tim Conway, EPA
Holly Inglis, EPA
Rose Howell, EPA*
K.C. Mitkevicius, USACE
Susan Steenstrup, MDEP (2 copies)
Anna Symington, MDEP*
Robert Bell, MDEP*
Thomas Angus, MDEP*
Linda Palmieri, Weston (2 copies)
Nancy E. Harper, MA AG*
Dale Young, MA EOEA
Tom Hickey, Director, PEDA
Mayor James Ruberto, City of Pittsfield
Pittsfield Department of Health
Jeffrey Bernstein, Bernstein, Cushner & Kimmell
Teresa Bowers, Gradient
Michael Carroll, GE*
Andrew Silfer, GE
Roderic McLaren, GE*
James Nuss, BBL
James Bieke, Goodwin Procter
Public Information Repositories
GE Internal Repository

**cover letter only*

Technical Drawings



LEGEND:

- SURVEY BENCHMARK
- GAS MARKER
- GUY ANCHOR
- MONITORING WELL
- WATER SUPPLY WELL
- SANITARY MANHOLE
- CATCH BASIN
- DRAIN MANHOLE
- WATER METER PIT
- ELECTRIC MANHOLE
- UTILITY POLE
- WATER VALVE
- FIRE HYDRANT
- RIPRAP
- CENTERLINE DITCH
- ABOVE GROUND STEAM PIPE
- DRAINAGE LINES
- OVERHEAD UTILITY
- CHAIN LINK FENCE
- WOOD STOCKADE FENCE
- APPROXIMATE LEASE AND EASEMENT LINE LOCATION (SEE NOTE 11)
- INFERRED PROPERTY LINE LOCATION
- INDEX CONTOUR LINE
- INTERMEDIATE CONTOUR LINE
- VEGETATION

NOTES:

1. BASE MAP INFORMATION SHOWN ON THIS DRAWING WAS DEVELOPED FROM FIELD SURVEY DATA OBTAINED BY BLASLAND, BOUCK & LEE, INC. ON 2/10/99; AS-BUILT FIELD SURVEY OBTAINED BY MAXYMILLIAN TECHNOLOGIES AND PREPARED BY HILL ENGINEERS, ARCHITECTS, & PLANNERS, INC. ON 1/19/00 (CADD FILE NO. MX-36-2.DWG); FIELD SURVEY PERFORMED BY HILL ENGINEERS, ARCHITECTS, & PLANNERS, INC. ON 3/8/00 AND 3/14/00 (CADD FILE NO. SRV-4541.DWG) REVISION A; FIELD SURVEY OF THE BUILDING 71 OPCA, ADJACENT AREA TO THE WEST, AND THE STORMWATER BASIN TO THE NORTHWEST OBTAINED BY SK DESIGN GROUP, INC. ON 12/8/00 (PROJECT NO. 000156); FIELD SURVEY PERFORMED BY HILL ENGINEERS, ARCHITECTS, & PLANNERS, INC. ON 12/27/01; AS-BUILT FIELD SURVEY OBTAINED BY D.R. BILLINGS AND PREPARED BY SK DESIGN GROUP, INC. ON 11/25/03 AND 1/7/04 (PROJECT NO. 020085-LDD); BUILDING 71, OPCA TOP OF LINER AND LEACHATE COLLECTION SYSTEM PLAN BY BLASLAND, BOUCK & LEE DATED MARCH 2002; AND FIELD SURVEY PERFORMED BY HILL ENGINEERS, ARCHITECTS & PLANNERS, INC. IN JANUARY 2005. CERTAIN FEATURES SHOWN MAY BE APPROXIMATE SINCE SNOW AND ICE ACCUMULATIONS WERE PRESENT AT THE TIME OF CERTAIN SURVEYS.
2. ELEVATIONS SHOWN ARE REFERENCED TO NATIONAL GEODETIC VERTICAL DATUM (NGVD 1929).
3. HORIZONTAL DATUM IS REFERENCED TO THE MASSACHUSETTS STATE PLANE COORDINATE SYSTEM (NAD 1927).
4. CONTOUR INTERVAL EQUALS 1 FOOT.
5. CONTRACTOR SHALL VERIFY THE PRESENCE AND LOCATION OF ALL ABOVE GROUND AND UNDERGROUND SITE FEATURES IN THE VICINITY OF PROPOSED CONSTRUCTION ACTIVITIES PRIOR TO COMMENCEMENT OF SITE WORK. ADDITIONAL SITE FEATURES MAY BE PRESENT WHICH ARE NOT SHOWN ON THIS DRAWING. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE WITH GE TO DETERMINE THE PRESENCE AND LOCATION OF SUCH FEATURES SHOULD THEY EXIST (AND WHICH MAY NOT BE SHOWN) AND THE LOCATION OF ON-SITE EASEMENTS, LEASE LINES, AND RIGHT-OF-WAYS.
6. CONTRACTOR SHALL ASSUME EXISTING FENCING AT PERIMETER OF SITE IS GE'S PROPERTY LINE. NO WORK SHALL BE PERFORMED OUTSIDE THE PROPERTY LINE WITHOUT GE'S PRIOR APPROVAL.
7. CONTRACTOR SHALL FURNISH AND PLACE PROPER GUARDS TO MINIMIZE POTENTIAL FOR ACCIDENTS.
8. CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR INITIATING, MAINTAINING, AND SUPERVISING ALL SAFETY PRECAUTIONS AND PROGRAMS. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS FOR THE SAFETY OF, AND SHALL PROVIDE THE NECESSARY PRECAUTION TO PREVENT DAMAGE, INJURY, OR LOSS TO ALL EMPLOYEES ON THE WORK SITE AND ANY OTHER PERSONS WHO MAY BE AFFECTED THEREBY.
9. EXISTING SURFACES OR FEATURES NOT SPECIFIED FOR MODIFICATION THAT ARE DAMAGED OR DESTROYED AS A RESULT OF WORK SHALL BE RESTORED BY THE CONTRACTOR TO THEIR PRECONSTRUCTION CONDITION AT THE CONTRACTOR'S EXPENSE AND TO THE SATISFACTION OF GE, IN A TIMELY MANNER.
10. ALL CONTRACTOR-RELATED ACTIVITIES SHALL BE PERFORMED IN A MANNER WHICH ALLOWS FOR ALL NECESSARY OPERATING ACTIVITIES ASSOCIATED WITH THE PITTSFIELD GENERATING COMPANY AND GENERAL DYNAMICS COMPANY FACILITIES. ANY WORK DEEMED NECESSARY WHICH MAY AFFECT THOSE FACILITIES SHALL BE BROUGHT TO THE ATTENTION OF GE PRIOR TO COMMENCEMENT OF SUCH WORK. GE SHALL PROVIDE THE CONTRACTOR WITH AUTHORIZATION TO PROCEED PROVIDED GE AND THE AFFECTED PARTY(IES) DEEM THE ACTION NECESSARY AND ACCEPTABLE.
11. LEASE AND EASEMENT LINE LOCATIONS SHOWN ON THIS DRAWING DIGITIZED FROM PLAN PREPARED BY DESIGN GROUP, INC. ENTITLED "PLAN OF LAND SURVEYED FOR GENERAL ELECTRIC COMPANY", DATED FEBRUARY 18, 1993 (PROJECT NO. 930004) AND ARE APPROXIMATE ONLY.
12. EXISTING CONCRETE PADS TO BE REMOVED AND DISPOSED OF WITHIN THE HILL 78 OPCA PRIOR TO CONSTRUCTION OF CELL 3.
13. EXISTING DRAIN PIPE TO BE REMOVED PRIOR TO CONSTRUCTION OF CELL 3.

X: 20405X00.DWG, 20405X01.DWG
L: ON=*, OFF=*REF*
P: PAGESET/SYR-CDL
6/13/05 SYR-85-KMD LAF BGP
C/20405001/CONSOL/20405G01.DWG

Graphic Scale
1"=100' 100' 0 100' 200'

THIS DRAWING WAS PREPARED AT THE SCALE INDICATED IN THE TITLE BLOCK. INACCURACIES IN THE STATED SCALE MAY BE INTRODUCED WHEN DRAWINGS ARE REPRODUCED. USE THE GRAPHIC SCALE BAR IN THE TITLE BLOCK TO DETERMINE THE ACTUAL SCALE OF THIS DRAWING.

No.	Date	Revisions	Init

Professional Engineer's Name: James M. Nuss		
Professional Engineer's No.: 38000		
State: MASS.	Date Signed:	
Project Mgr.: WAR	Designed by: PHB	Drawn by: LAF

BBL® BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

GENERAL ELECTRIC COMPANY, • PITTSFIELD, MASSACHUSETTS
BUILDING 71 OPCA CELL 3 BASELINER CONSTRUCTION

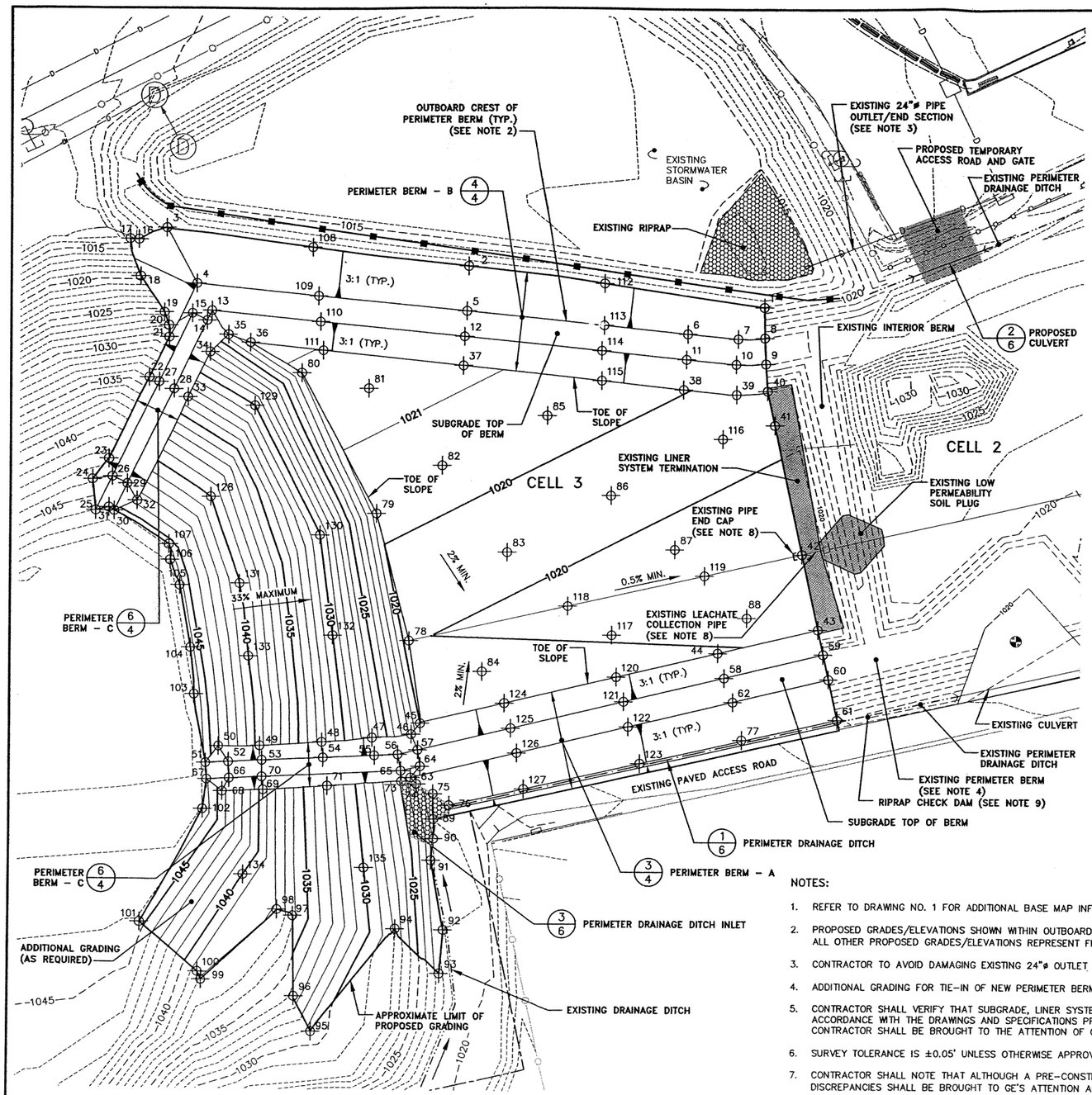
EXISTING SITE PLAN

GENERAL

BBL Project No. 204.05
Date JUNE 2005

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

1



X: 20405X00, X01.DWG
L: ON=*, OFF=REF*
P: PAGESET/PLT-CDL
6/13/05 SYR-85-KMD LAF BGP
C/20405001/CONSOL/20405G02.DWG

SURVEY CONTROL INFORMATION CONSTRUCTION POINTS						
POINT NO.	NORTHING	EASTING	EXISTING ELEV.	PROP. ELEV.	AS BUILT ELEV. *	DESCRIPTION
1	535817.77	136324.85	1018.82	1019.05		BERM TOE
2	535837.46	136180.76	1015.46	1018.87		BERM TOE
3	535855.90	136033.60	1014.13	1018.60		BERM TOE
4	535828.95	136048.45	1017.82	1027.05		BERM CREST
5	535815.71	136180.08	1016.48	1025.93		BERM CREST
6	535804.91	136287.49	1018.14	1024.95		BERM CREST
7	535802.46	136312.16	1018.91	1024.68		BERM CREST
8	535802.88	136325.18	1018.88	1024.21		BERM CREST
9	535790.29	136325.77	1018.19	1024.29		BERM CREST
10	535790.09	136311.27	1018.96	1024.68		BERM CREST
11	535792.50	136286.95	1017.66	1024.95		BERM CREST
12	535803.35	136179.03	1015.88	1025.93		BERM CREST
13	535815.74	136055.88	1020.59	1027.05		BERM CREST
14	535810.97	136053.60	1022.57	1027.10		BERM CREST
15	535814.35	136046.35	1022.92	1027.11		BERM CREST
16	535850.28	136020.40	1014.43	1015.50		BERM TOE
17	535850.56	136016.13	1014.27	1014.19		BERM TOE
18	535832.30	136021.24	1019.48	1019.41		BERM TOE
19	535814.80	136032.64	1025.51	1025.44		BERM TOE
20	535808.48	136034.81	1027.11	1027.04		BERM TOE
21	535802.70	136035.03	1028.93	1028.86		BERM TOE
22	535783.09	136025.65	1033.84	1033.77		BERM TOE
23	535743.23	136006.51	1042.59	1042.52		BERM TOE
24	535733.20	135998.75	1043.75	1043.68		BERM TOE
25	535718.03	136000.30	1046.03	1045.46		BERM TOE
26	535734.59	136008.22	1043.69	1045.46		BERM CREST
27	535780.85	136030.33	1033.75	1035.50		BERM CREST
28	535777.40	136037.55	1033.59	1035.50		BERM CREST
29	535731.14	136015.44	1043.52	1045.46		BERM CREST
30	535717.91	136009.11	1046.03	1045.46		BERM TOE
31	535719.55	136006.57	1046.03	1045.46		BERM TOE
32	535722.92	136020.29	1044.26	1043.69		BERM TOE
33	535773.46	136044.44	1033.58	1033.00		BERM TOE
34	535795.50	136055.13	1027.24	1027.41		BERM TOE
35	535804.06	136064.02	1022.73	1023.36		BERM TOE
36	535800.22	136074.90	1021.84	1022.35		BERM TOE
37	535789.21	136178.55	1015.52	1021.21		BERM TOE
38	535777.84	136285.65	1018.55	1020.04		BERM TOE
39	535775.38	136311.56	1016.03	1019.76		BERM TOE
40	535777.07	136326.70	1016.84	1019.88		BERM TOE
41	535760.44	136330.36	1017.84	1019.32		BERM TOE
42	535697.60	136344.24	1021.86	1018.08		BERM TOE
43	535660.94	136352.37	1018.66	1018.80		BERM TOE
44	535649.41	136303.40	1013.07	1019.07		BERM TOE
45	535615.03	136159.04	1020.13	1020.00		BERM TOE
46	535609.68	136154.71	1021.46	1021.69		BERM TOE
47	535607.93	136135.62	1026.45	1026.76		BERM TOE
48	535605.63	136111.22	1031.03	1032.37		BERM TOE
49	535603.62	136080.98	1040.05	1039.46		BERM TOE
50	535603.39	136060.67	1044.95	1044.13		BERM TOE
51	535595.25	136054.39	1046.51	1045.65		BERM TOE
52	535595.79	136065.58	1043.84	1045.65		BERM CREST
53	535596.60	136082.07	1039.75	1041.63		BERM CREST
54	535598.05	136111.83	1030.47	1034.86		BERM CREST
55	535599.26	136136.84	1026.23	1029.52		BERM CREST
56	535599.82	136148.24	1023.56	1026.67		BERM CREST
57	535602.11	136157.90	1021.18	1024.10		BERM CREST
58	535637.36	136306.62	1018.79	1023.20		BERM CREST
59	535648.93	136355.03	1018.60	1022.90		BERM CREST
60	535636.83	136357.72	1018.55	1022.90		BERM CREST
61	535617.15	136362.08	1018.45	1016.17		BERM TOE
62	535625.64	136310.91	1018.75	1023.16		BERM CREST
63	535588.58	136154.58	1022.78	1024.14		BERM CREST
64	535594.10	136159.11	1021.39	1024.10		BERM CREST

* AS-BUILT INFORMATION TO BE COMPLETED BY CONTRACTOR AND INCLUDED WITH RECORD DRAWINGS.

SURVEY CONTROL INFORMATION CONSTRUCTION POINTS						
POINT NO.	NORTHING	EASTING	EXISTING ELEV.	PROP. ELEV.	AS BUILT ELEV. *	DESCRIPTION
65	535591.88	136149.76	1023.69	1026.60		BERM CREST
66	535587.80	136065.97	1043.76	1045.65		BERM CREST
67	535587.27	136054.93	1046.44	1045.65		BERM TOE
68	535581.47	136062.70	1044.55	1044.45		BERM TOE
69	535582.29	136082.76	1039.27	1039.52		BERM TOE
70	535588.59	136082.09	1039.61	1041.72		BERM CREST
71	535584.36	136113.94	1029.14	1032.69		BERM TOE
73	535586.75	136150.08	1023.93	1024.87		BERM TOE
74	535585.48	136157.39	1022.32	1022.90		BERM TOE
75	535580.79	136165.54	1020.72	1020.72		BERM TOE
76	535575.27	136173.29	1020.52	1018.29		BERM TOE
77	535607.26	136315.37	1018.71	1016.85		BERM TOE
78	535655.22	136153.24	1019.39	1019.05		BERM TOE
79	535717.06	136136.89	1020.37	1020.30		BERM TOE
80	535785.46	136100.01	1021.65	1021.86		BERM TOE
81	535778.00	136132.61	1015.71	1021.43		FLOOR
82	535740.55	136168.65	1015.93	1020.43		FLOOR
83	535698.42	136200.48	1018.48	1019.40		FLOOR
84	535640.37	136188.78	1018.54	1019.33		FLOOR
85	535764.89	136219.21	1015.37	1020.41		FLOOR
86	535726.04	136250.57	1017.84	1019.43		FLOOR
87	535699.79	136281.99	1021.04	1018.68		FLOOR
88	535666.58	136317.51	1018.92	1018.71		FLOOR
89	535568.50	136165.90	1021.39	1021.39		BERM TOE
90	535558.96	136165.94	1021.96	1021.89		BERM TOE
91	535548.45	136164.80	1022.48	1022.48		BERM TOE
92	535514.75	136171.10	1021.27	1021.27		BERM TOE
93	535493.66	136169.39	1022.48	1022.48		BERM TOE
94	535515.21	136147.72	1027.78	1027.78		BERM TOE
95	535465.38	136107.08	1030.54	1030.54		BERM TOE
96	535482.35	136098.65	1033.62	1033.62		BERM TOE
97	535521.34	136097.82	1036.28	1036.28		BERM TOE
98	535524.26	136090.07	1037.93	1037.93		BERM TOE
99	535489.96	136053.09	1037.83	1037.83		BERM TOE
100	535493.82	136051.26	1038.48	1038.48		BERM TOE
101	535517.83	136022.84	1045.54	1045.54		BERM TOE
102	535572.78	136053.03	1046.86	1046.86		BERM TOE
103	535628.57	136048.45	1046.96	1046.96		BERM TOE
104	535651.34	136046.56	1046.51	1046.51		BERM TOE
105	535681.73	136041.06	1046.51	1046.51		BERM TOE
106	535694.02	136036.23	1046.76	1046.76		BERM TOE
107	535701.65	136035.54	1045.78	1045.78		BERM TOE
108	535846.60	136104.82	1014.58	1018.79		BERM TOE
109	535822.97	136107.88	1015.21	1026.59		BERM CREST
110	535810.41	136108.91	1015.15	1026.56		BERM CREST
111	535796.45	136110.38	1016.11	1021.96		BERM TOE
112	535829.36	136246.71	1017.92	1018.96		BERM TOE
113	535809.02	136246.62	1016.96	1025.32		BERM CREST
114	535796.67	136245.53	1016.27	1025.32		BERM CREST
115	535782.09	136245.61	1015.76	1020.48		BERM TOE
116	535753.76	136305.04	1017.57	1019.43		FLOOR
117	535658.16	136251.54	1018.93	1018.93		FLOOR
118	535672.26	136230.03	1018.73	1018.66		FLOOR
119	535687.03	136296.59	1022.38	1018.32		FLOOR
120	535637.76	136253.92	1022.10	1019.33		BERM TOE
121	535625.80	136257.64	1020.58	1023.49		BERM CREST
122	535613.61	136259.96	1019.30	1023.50		BERM CREST
123	535595.78	136265.73	1019.01	1017.25		BERM TOE
124	535625.01	136199.76	1019.23	1019.63		BERM TOE
125	535612.81	136202.95	1019.40	1023.83		BERM CREST
126	535600.78	136205.95	1019.58	1023.83		BERM CREST
127	535583.25	136209.30	1019.95	1017.89		BERM TOE
128	535724.86	136055.94	1040.57	1040.00		OVERLINER FLOOR
129	535769.43	136077.27	1030.57	1030.00		OVERLINER FLOOR
130	535706.50	136109.45	1030.57	1030.00		OVERLINER FLOOR
131	535682.73	136070.40	1040.57	1040.00		OVERLINER FLOOR
132	535657.69	136116.00	1030.58	1030.00		OVERLINER FLOOR
133	535647.30	136075.03	1040.62	1040.00		OVERLINER FLOOR
134	535541.10	136073.22	1038.72	1040.00		OVERLINER FLOOR
135	535544.73	136132.13	1028.34	1030.00		OVERLINER FLOOR

NOTES:

1. REFER TO DRAWING NO. 1 FOR ADDITIONAL BASE MAP INFORMATION.
2. PROPOSED GRADES/ELEVATIONS SHOWN WITHIN OUTBOARD CREST OF BERMS AND EMBANKMENT REPRESENT TOP OF SUBGRADE. ALL OTHER PROPOSED GRADES/ELEVATIONS REPRESENT FINAL GRADE.
3. CONTRACTOR TO AVOID DAMAGING EXISTING 24"ø OUTLET PIPE AND END SECTION.
4. ADDITIONAL GRADING FOR TIE-IN OF NEW PERIMETER BERM WITH EXISTING PERIMETER BERM MAY BE REQUIRED (NOT SHOWN).
5. CONTRACTOR SHALL VERIFY THAT SUBGRADE, LINER SYSTEM AND LEACHATE COLLECTION PIPE TIE-IN CONDITIONS ARE IN ACCORDANCE WITH THE DRAWINGS AND SPECIFICATIONS PRIOR TO THEIR CONSTRUCTION. DISCREPANCIES IDENTIFIED BY THE CONTRACTOR SHALL BE BROUGHT TO THE ATTENTION OF GE.
6. SURVEY TOLERANCE IS ±0.05' UNLESS OTHERWISE APPROVED BY GE OR GE'S REPRESENTATIVE.
7. CONTRACTOR SHALL NOTE THAT ALTHOUGH A PRE-CONSTRUCTION SURVEY HAS BEEN PERFORMED BY OTHERS, ANY NOTED DISCREPANCIES SHALL BE BROUGHT TO GE'S ATTENTION AND ADDRESSED ACCORDINGLY.
8. REFER TO DRAWING NO. 3 FOR LINER SYSTEM AND LEACHATE COLLECTION PIPE INFORMATION.
9. RIPRAP CHECK DAM TO HAVE A MINIMUM CREST WIDTH OF 12 INCHES AND A MAXIMUM VERTICAL HEIGHT OF NO LESS THAN 6 INCHES BELOW THE TOP OF THE ACCESS ROAD.

LEGEND:

- 1018 — PROPOSED CONTOUR LINE
- PROPOSED CHANGE-IN-GRADE
- PROPOSED PERIMETER DRAINAGE DITCH
- (1/5) DETAIL REFERENCE NUMBER / DRAWING REFERENCE NUMBER
- CONSTRUCTION SURVEY CONTROL POINT (SEE TABLE ON THIS DRAWING)
- SILT FENCE (5/6)

Graphic Scale
30' 0 30' 60'

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No.	Date	Revisions	Init

Professional Engineer's Name: James M. Nuss
Professional Engineer's No.: 38000
State: MASS. Date Signed:
Project Mgr.: WAR Designed by: PHB Drawn by: KMD

BBL BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

GENERAL ELECTRIC COMPANY, • PITTSFIELD, MASSACHUSETTS
BUILDING 71 OPCA CELL 3 BASELINER CONSTRUCTION

BUILDING 71 OPCA SUBGRADE PLAN

GENERAL

BBL Project No. 204.05
Date JUNE 2005

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120

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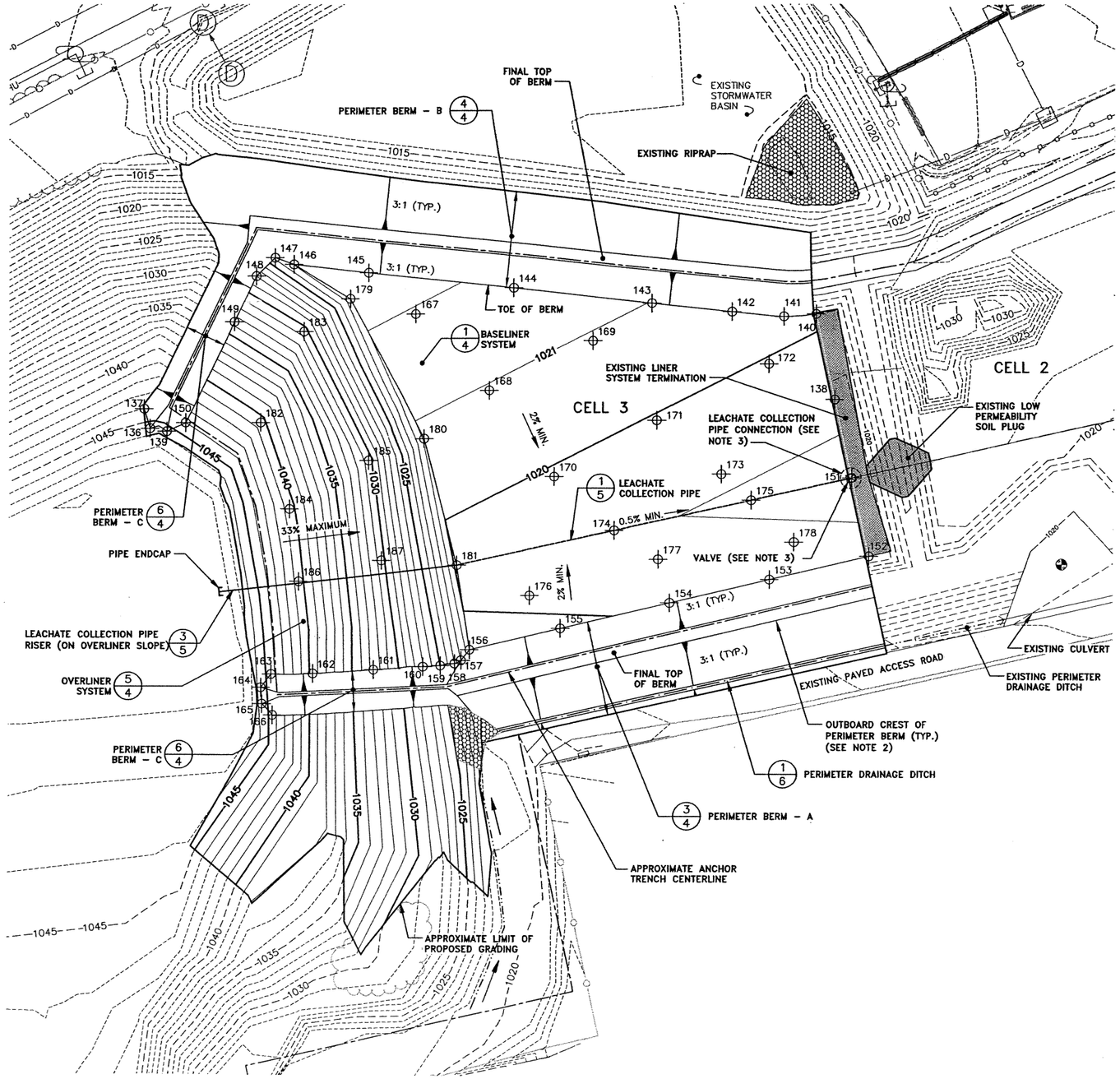

X: 20405X00, X01.DWG
L: ON=*, OFF=REF*
P: PAGESET/PLT-CDL
6/13/05 SYR-85-KMD LAF BGP
C/20405001/CONSOL/20405G03.DWG

SURVEY CONTROL INFORMATION CONSTRUCTION POINTS

POINT NO.	NORTHING	EASTING	EXISTING ELEV.	PROP. ELEV.	AS BUILT ELEV. *	DESCRIPTION
136	535721.96	136002.18	1045.53	1045.46		BERM TOE
137	535731.52	135999.26	1044.02	1043.95		BERM TOE
138	535736.28	136337.19	1018.20	1019.33		FLOOR
139	535720.54	136010.37	1045.53	1045.46		BERM TOE
140	535778.12	136327.91	1016.66	1020.16		BERM TOE
141	535776.95	136312.25	1016.44	1020.28		BERM TOE
142	535779.30	136286.81	1018.56	1020.55		BERM TOE
143	535783.43	136247.99	1015.80	1020.98		BERM TOE
144	535790.61	136180.34	1015.51	1021.72		BERM TOE
145	535798.17	136109.14	1015.80	1022.50		BERM TOE
146	535802.10	136072.17	1021.77	1022.91		BERM TOE
147	535805.33	136062.84	1022.56	1023.76		BERM TOE
148	535796.38	136053.66	1027.25	1027.94		BERM TOE
149	535774.01	136042.93	1033.64	1033.57		BERM TOE
150	535724.75	136019.43	1044.07	1044.00		BERM TOE
151	535697.92	136345.70	1021.82	1018.57		FLOOR
152	535659.73	136354.17	1018.64	1019.33		BERM TOE
153	535648.32	136305.73	1018.86	1019.59		BERM TOE
154	535636.90	136257.21	1021.93	1019.85		BERM TOE
155	535624.36	136203.92	1019.24	1020.14		BERM TOE
156	535613.94	136159.68	1020.04	1020.37		BERM TOE
157	535608.68	136155.56	1021.32	1022.00		BERM TOE
158	535607.19	136152.47	1022.13	1023.10		BERM TOE
159	535606.17	136145.49	1023.81	1025.12		BERM TOE
160	535605.67	136136.94	1025.99	1027.25		BERM TOE
161	535604.16	136112.32	1030.63	1032.70		BERM TOE
162	535602.24	136082.33	1039.71	1039.63		BERM TOE
163	535601.86	136061.66	1044.72	1044.44		BERM TOE
164	535595.36	136056.64	1045.97	1045.65		BERM TOE
165	535587.38	136057.18	1045.90	1045.65		BERM TOE
166	535581.87	136062.37	1044.64	1044.53		BERM TOE
167	535778.00	136132.61	1015.71	1021.93		FLOOR
168	535740.55	136168.65	1015.93	1020.93		FLOOR
169	535764.89	136219.21	1015.37	1020.91		FLOOR
170	535698.42	136200.48	1018.48	1019.90		FLOOR
171	535726.04	136250.57	1017.84	1019.93		FLOOR
172	535753.76	136305.04	1017.57	1019.93		FLOOR
173	535699.79	136281.99	1021.04	1019.18		FLOOR
174	535672.26	136230.03	1018.73	1019.16		FLOOR
175	535687.03	136296.59	1022.38	1018.82		FLOOR
176	535640.37	136188.78	1018.54	1019.83		FLOOR
177	535658.16	136251.54	1020.66	1019.43		FLOOR
178	535666.58	136317.51	1018.92	1019.21		FLOOR
179	535785.49	136100.07	1021.63	1022.36		BERM TOE
180	535717.08	136136.94	1020.35	1020.80		BERM TOE
181	535655.22	136153.24	1019.39	1019.55		BERM TOE
182	535724.86	136055.94	1040.57	1040.50		OVERLINER FLOOR
183	535769.43	136077.27	1030.57	1030.50		OVERLINER FLOOR
184	535682.73	136070.40	1040.57	1040.50		OVERLINER FLOOR
185	535706.50	136109.45	1030.57	1030.50		OVERLINER FLOOR
186	535647.30	136075.03	1040.62	1040.55		OVERLINER FLOOR
187	535657.69	136116.00	1030.58	1030.50		OVERLINER FLOOR

* AS-BUILT INFORMATION TO BE COMPLETED BY CONTRACTOR AND INCLUDED WITH RECORD DRAWINGS.

LEGEND:

- 1019 — PROPOSED CONTOUR LINE
- PROPOSED CHANGE-IN-GRADE
- PROPOSED LINER SYSTEM ANCHOR TRENCH CENTERLINE
- 1/5 — DETAIL REFERENCE NUMBER / DRAWING REFERENCE NUMBER
- 73 — CONSTRUCTION SURVEY CONTROL POINT (SEE TABLE THIS DRAWING)

NOTES:

1. REFER TO DRAWING NO. 1 FOR ADDITIONAL BASE MAP INFORMATION.
2. PROPOSED GRADES/ELEVATIONS SHOWN WITHIN OUTBOARD CREST OF BERMS AND EMBANKMENT REPRESENT TOP OF LINER SYSTEM. ALL OTHER PROPOSED GRADES/ELEVATIONS REPRESENT FINAL GRADE.
3. CONTRACTOR SHALL CONNECT NEW 6"ø HDPE LEACHATE COLLECTION PIPE TO EXISTING LEACHATE COLLECTION PIPE USING A CLOW RESILIENT WEDGE VALVE. VALVE SHALL BE INSTALLED CONSISTENT WITH PREVIOUS LEACHATE COLLECTION PIPE CONNECTIONS FOR CELL 2. CONTRACTOR SHOULD NOTE THAT REMOVING SOIL MATERIALS AND UNDERLYING PIPE SUPPORT WILL BE NECESSARY TO EXPOSE THE EXISTING PIPE TO ALLOW FOR NEW PIPE TO BE SET AT ITS SPECIFIED INVERT ELEVATION.
4. CONTRACTOR SHALL EXPOSE EXISTING GEOSYNTHETICS USING EXTREME CARE. ANY DAMAGE TO THE GEOSYNTHETICS CAUSED BY THE CONTRACTOR SHALL BE REPAIRED IN ACCORDANCE WITH THE PROJECT GEOSYNTHETIC SPECIFICATIONS AND AT THE CONTRACTORS EXPENSE.
5. CONTRACTOR SHALL VERIFY THAT SUBGRADE, LINER SYSTEM AND LEACHATE COLLECTION PIPE TIE-IN CONDITIONS ARE IN ACCORDANCE WITH THE DRAWINGS AND SPECIFICATIONS PRIOR TO THEIR CONSTRUCTION. DESCREPANCIES IDENTIFIED BY THE CONTRACTOR SHALL BE BROUGHT TO THE ATTENTION OF GE.
6. SURVEY TOLERANCE IS ±0.05' UNLESS OTHERWISE APPROVED BY GE OR GE'S REPRESENTATIVE.
7. REFER TO DRAWING NO. 2 FOR ADDITIONAL CONSTRUCTION INFORMATION.

Graphic Scale
30' 0 30' 60'

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Project Mgr.: WAR Designed by: CAA Drawn by: KMD

BBL BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

GENERAL ELECTRIC COMPANY, • PITTSFIELD, MASSACHUSETTS
BUILDING 71 OPCA CELL 3 BASELINER CONSTRUCTION

BUILDING 71 OPCA TOP OF LINER AND LEACHATE COLLECTION SYSTEM PLAN

GENERAL

BBL Project No. 204.05
Date JUNE 2005

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Corporate Headquarters
6723 Towpath Road
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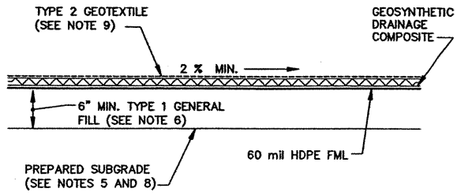
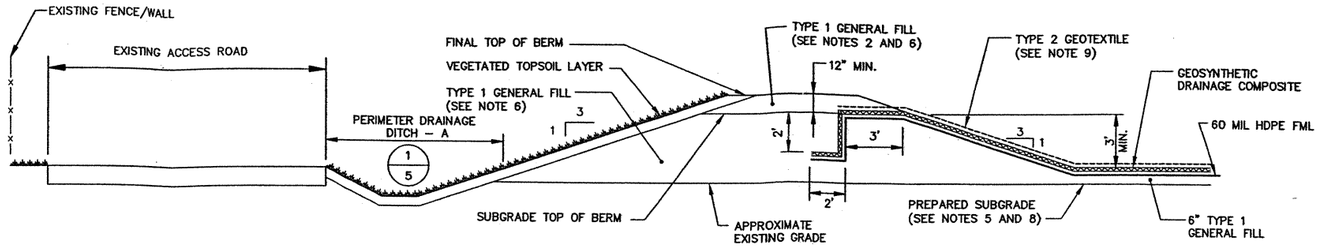


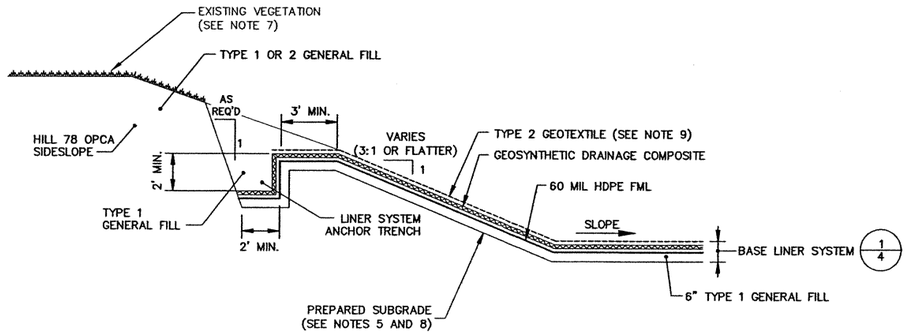
BASELINER SYSTEM (1)

NOT TO SCALE



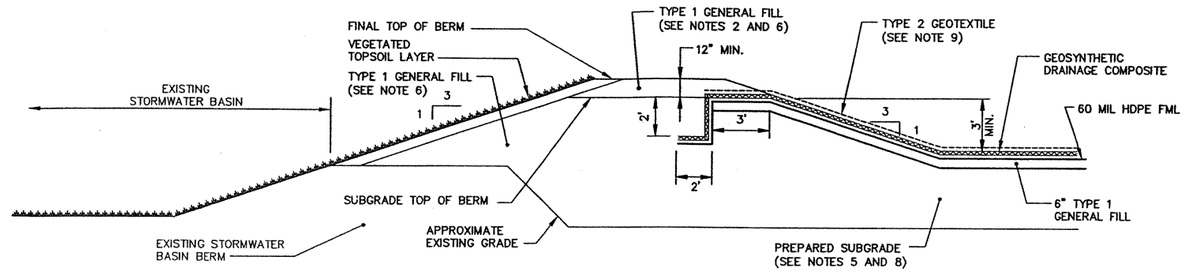
PERIMETER BERM - A (3)

NOT TO SCALE



OVERLINER SYSTEM (5)

NOT TO SCALE

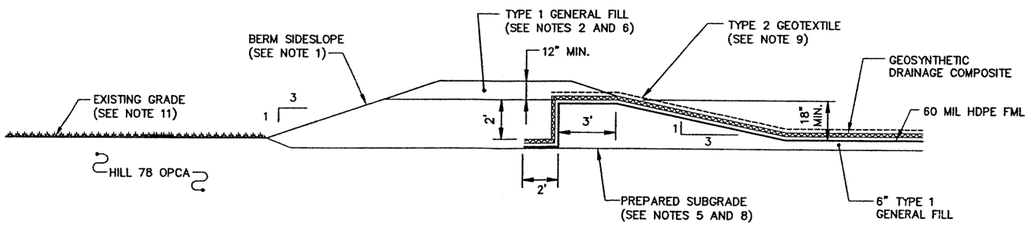


PERIMETER BERM - B (4)

NOT TO SCALE

NOTES:

1. GEOSYNTHETIC MATERIALS ARE SHOWN AT AN EXAGGERATED SCALE FOR CLARITY.
2. A MINIMUM OF 12-INCHES OF TYPE 1 GENERAL FILL MUST BE PLACED ABOVE ANCHOR TRENCH RUNOUT.
3. EXISTING CHAIN LINK FENCE TO BE REMOVED AND/OR MOODIFIED WHERE NECESSARY TO FACILITATE CONSTRUCTION OF LINER SYSTEM. SCRAP MATERIAL SHALL BE DISPOSED OF IN ACCORDANCE WITH THE PROJECT REQUIREMENTS.
4. CONTRACTOR SHALL REMOVE EXISTING MULCH/WOOD CHIPS AND/OR TARPS IN AREA DESIGNATED FOR LINER AND BERM CONSTRUCTION. REMOVED MATERIAL SHALL BE DISPOSED OF IN ACCORDANCE WITH THE PROJECT REQUIREMENTS.
5. AREAS DESIGNATED FOR LINER AND BERM CONSTRUCTION SHALL BE CLEARED OF ALL DELETERIOUS MATERIAL (I.E. VEGETATION, STONES, CONCRETE, PIPES, MANHOLES, ETC.), PROOF-ROLLED AND REGRADED AND/OR FILLED AS NECESSARY WITH TYPE 1 GENERAL FILL, TO PROVIDE A FIRM, UNIFORM SOIL SURFACE FREE FROM PROTRUDING OBJECTS. PROOF-ROLLING SHALL BE PERFORMED IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
6. TYPE 1 GENERAL FILL USED FOR SUBBASE LAYER AND BERM CONSTRUCTION SHALL PROVIDE A FIRM, UNIFORM SOIL SURFACE FREE FROM PROTRUDING OBJECTS.
7. EXISTING VEGETATION ON THE HILL 78 OPCA THAT IS DISTURBED/REMOVED AS A RESULT OF CONSTRUCTION ACTIVITIES SHALL BE REPLACED OR COVERED (I.E. WITH WOODCHIPS OR TARPS) IMMEDIATELY FOLLOWING COMPLETION OF FINAL GRADING.
8. EXISTING SUBGRADE TO BE REGRADED AND/OR FILLED AS NECESSARY TO ACHIEVE THE PROPOSED LINES AND GRADES SHOWN ON DRAWING NOS. 2 AND 3.
9. TYPE 2 GEOTEXTILE SHALL BE PLACED, SEWN, AND PROPERLY ANCHORED (E.G., SANDBAGS, RUBBER TIRES) TO RESIST WIND FORCES AND PREVENT ANY PORTION OF THE GEOSYNTHETIC DRAINAGE COMPOSITE FROM BEING EXPOSED TO ULTRAVIOLET RAYS (INTENDED FOR CELL AREAS WHERE WASTE PLACEMENT IS NOT EXPECTED WITHIN 30 DAYS OF COMPLETED LINER INSTALLATION). (TO BE REMOVED LATER BY OTHERS.)
10. HAY BALES SHALL BE STAKED ACROSS THE WIDTH OF THE NEW PERIMETER DITCH AT 50-FOOT INTERVALS.
11. ADDITIONAL GRADING BEYOND LIMIT OF PERIMETER BERM-C MAY BE REQUIRED TO FACILITATE CONSTRUCTION ACTIVITIES.



NOTE:

1. BERM SIDESLOPE TO BE STABILIZED AS NECESSARY TO MINIMIZE THE POTENTIAL FOR EROSION (E.G., TEMPORARY EROSION CONTROL MAT, WOOD CHIPS).

PERIMETER BERM - C (6)

NOT TO SCALE

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L: ON=*, OFF=REF*
P: PAGESET/PLT-CDL
6/13/05 SYR-85-TJR LAF BGP
C/20405001/CONSOL/20405G04.DWG

Graphic Scale

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Professional Engineer's Name: James M. Nuss		
Professional Engineer's No.: 38000		
State: MASS.	Date Signed:	
Project Mgr.: WAR	Designed by: PHB	Drawn by: TJR

BLASLAND, BOUCK & LEE, INC.
engineers, scientists, economists

GENERAL ELECTRIC COMPANY, • PITTSFIELD, MASSACHUSETTS
BUILDING 71 OPCA CELL 3 BASELINER CONSTRUCTION

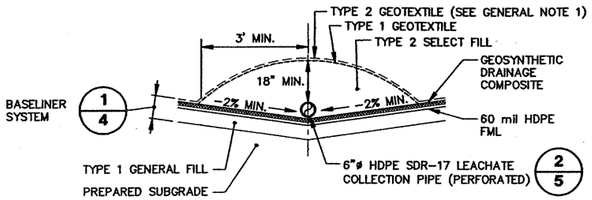
LINER SYSTEM DETAILS

GENERAL

BBL Project No. 204.05

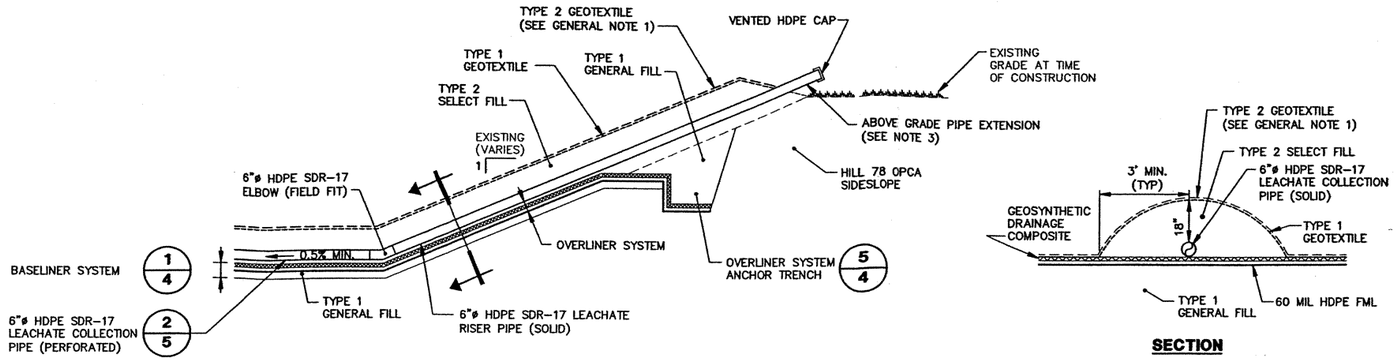
Date JUNE 2005

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
6723 Towpath Road
Syracuse, NY 13214
315-446-9120



LEACHATE COLLECTION PIPE/ LINER SYSTEM (1)

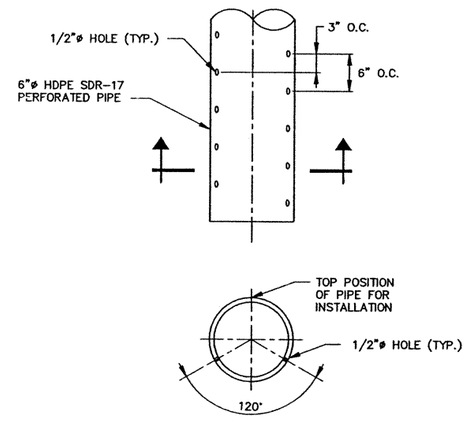
NOT TO SCALE



SECTION

LEACHATE COLLECTION PIPE CLEANOUT RISER (3)

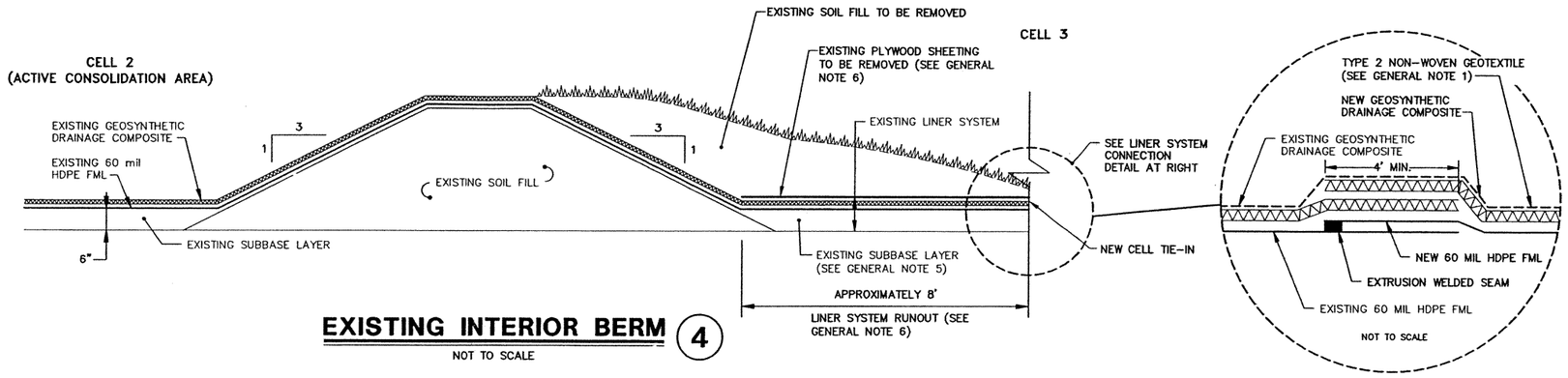
NOT TO SCALE



SECTION

LEACHATE COLLECTION PIPE (2)

NOT TO SCALE



EXISTING INTERIOR BERM (4)

NOT TO SCALE

GENERAL NOTES:

1. TYPE 2 GEOTEXTILE SHALL BE PLACED AND PROPERLY ANCHORED (E.G., SANDBAGS, RUBBER TIRES) TO RESIST WIND FORCES AND PREVENT ANY PORTION OF THE GEOSYNTHETIC DRAINAGE COMPOSITE FROM BEING EXPOSED TO ULTRAVIOLET RAYS. (TO BE REMOVED LATER BY OTHERS.)
2. TYPE 1 GENERAL FILL USED FOR SUBBASE LAYER AND BERM CONSTRUCTION SHALL PROVIDE A FIRM, UNIFORM SOIL SURFACE FREE FROM STONES OR OTHER PROTRUDING OBJECTS.
3. RISER PIPE TO BE EXTENDED TO ELEVATION 1049.7 FEET. PIPE EXTENSION TO BE SUPPORTED AND PROTECTED AS NECESSARY TO PREVENT DEFLECTION AND DAMAGE.
4. GEOSYNTHETIC MATERIALS ARE SHOWN AT AN EXAGGERATED SCALE FOR CLARITY.
5. EXISTING SUBBASE LAYER TO BE REGRADED AND/OR FILLED AS NECESSARY, TO ACHIEVE THE PROPOSED LINES AND GRADES SHOWN ON DRAWING NOS. 2 AND 3.
6. EXISTING SOIL FILL, VEGETATION AND PLYWOOD SHEETING SHALL BE REMOVED FROM EXISTING LINEAR SYSTEM RUNOUT PRIOR TO THE CONNECTION OF NEW AND THE EXISTING LINER SYSTEMS. MATERIAL ABOVE GEOSYNTHETICS SHALL BE CAREFULLY REMOVED USING ROUNDED PLASTIC HANDTOOLS AS NECESSARY TO AVOID DAMAGE TO UNDERLYING GEOSYNTHETICS.
7. NEW GEOSYNTHETIC DRAINAGE COMPOSITE SHALL OVERLAP THE EXISTING GEOSYNTHETIC DRAINAGE COMPOSITE A MINIMUM OF 4 FEET AND BE TIED APPROXIMATELY EVERY 6 INCHES ACROSS THE WIDTH OF THE CELL.
8. NEW 60 MIL HDPE FML SHALL OVERLAP THE EXISTING 60 MIL. MIL HDPE FML A MINIMUM OF 4 FEET AND EXTRUSION WELDED.

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Graphic Scale: AS SHOWN

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Professional Engineer's Name: James M. Nuss
Professional Engineer's No.: 38000
State: MASS. Date Signed:
Project Mgr.: WAR Designed by: PHB Drawn by: GHS

BLASLAND, BOUCK & LEE, INC.
engineers, scientists, economists

GENERAL ELECTRIC COMPANY, • PITTSFIELD, MASSACHUSETTS
BUILDING 71 OPCA CELL 3 BASELINER CONSTRUCTION

LINER AND LEACHATE COLLECTION SYSTEM DETAILS

GENERAL

BBL Project No. 204.05
Date JUNE 2005

Blasland, Bouck & Lee, Inc.
Corporate Headquarters
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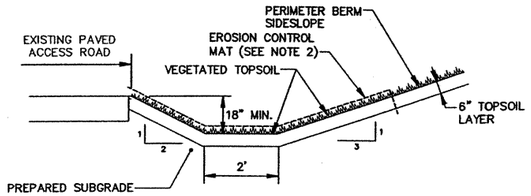
315-446-9120

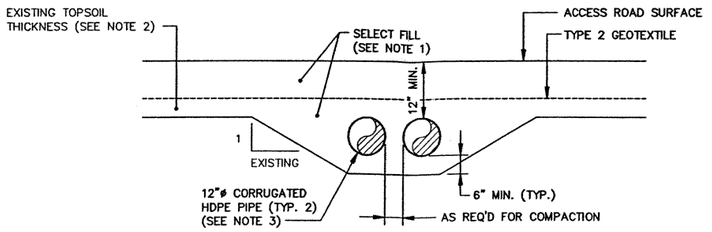


NOTES:

1. EROSION CONTROL MAT SHALL BE NORTH AMERICAN GREEN SC150 OR EQUAL INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS.

PERIMETER DRAINAGE DITCH (1)

NOT TO SCALE

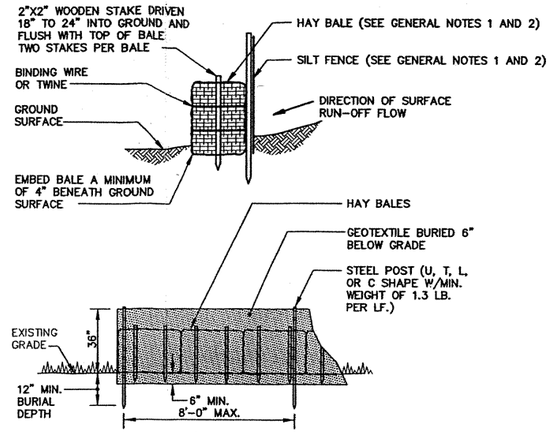


NOTES:

1. SELECT FILL SHALL BE COMPACTED DENSE GRADE CRUSHED STONE M2.01.7 OR EQUAL.
2. EXISTING TOPSOIL AND VEGETATION TO BE REMOVED BENEATH ACCESS ROAD AND CULVERT PRIOR TO PLACEMENT OF SELECT FILL MATERIAL.
3. CORRUGATED HDPE PIPE SHALL BE ADS N-12 OR EQUIVALENT. CONTRACTOR SHALL INSTALL PIPE IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.

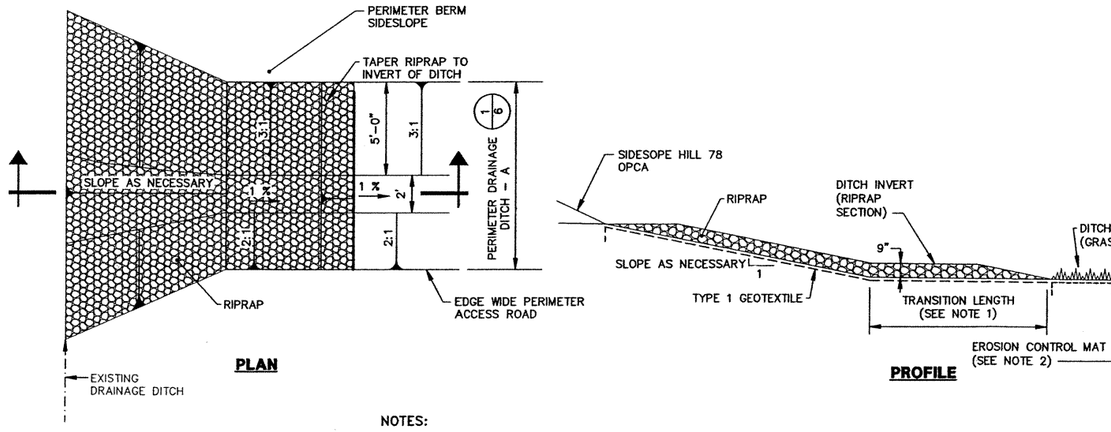
CULVERT (2)

NOT TO SCALE



HAY BALE/SILT FENCE (4)

NOT TO SCALE

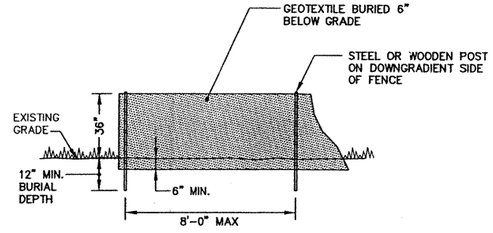


NOTES:

1. RIPRAP WITHIN DITCH TRANSITION LENGTH SHALL BE SORTED AND GRADED TO PROVIDE FOR MAXIMUM FLOW DISTRIBUTION AND VELOCITY DISSIPATION.

PERIMETER DRAINAGE DITCH INLET (3)

NOT TO SCALE



SILT FENCE (5)

NOT TO SCALE

GENERAL NOTES:

1. HAY BALES AND SILT FENCING WILL BE REMOVED BY THE CONTRACTOR WHEN REQUESTED BY GE.
2. THE CONTRACTOR SHALL MAINTAIN THE INTEGRITY OF THE HAY BALES AND SILT FENCING AS LONG AS THEY ARE NECESSARY.

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P: PAGESET/PLT-CDL
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Project Mgr.: WAR Designed by: PHB Drawn by: GMS

BBL BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

GENERAL ELECTRIC COMPANY, • PITTSFIELD, MASSACHUSETTS
BUILDING 71 OPCA CELL 3 BASELINER CONSTRUCTION

EROSION CONTROL AND DRAINAGE DETAILS

GENERAL

BBL Project No. 204.05
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Specifications

MATERIALS & PERFORMANCE SPECIFICATIONS

Section 01160 - Survey Control

Section 02110 - Clearing and Grubbing

Section 02200 - Earthwork

Section 02207 - Restoration of Surfaces

Section 02212 - Topsoil, Seeding and Mulch

Section 02219 - Geosynthetic Drainage Composite

Section 02222 - Soil Fill Materials

Section 02232 - Geotextile Fabric

Section 02233 - Silt Fencing

Section 02234 - Flexible Membrane Liner

Section -02271 - Riprap

Section 02526 – High-Density Polyethylene Pipe

MATERIALS AND PERFORMANCE - SECTION 01160

SURVEY CONTROL

PART 1 - GENERAL

1.01 DESCRIPTION

A. Survey control for construction purposes is provided on the Technical Drawings. The Contractor shall safeguard all survey points and bench marks. Should any of these points be destroyed, the replacement cost shall be borne by the Contractor. The Contractor shall assume the entire expense of rectifying work improperly constructed due to failure to maintain and protect such established survey points and bench marks.

B. The Contractor shall be responsible for the layout of any additional survey controls, grid coordinate locations, lines, grades, and elevations necessary for the proper construction and testing of the work called for by the Technical Drawings and Specifications, at no additional cost to GE. Survey activities shall include, but not be limited to: maintaining appropriate slopes and specified layer thicknesses.

C. Vertical survey tolerance to be maintained during construction of the Building 71 OPCA cell is 0.05 feet unless otherwise approved by GE or GE's Representative.

D. The Contractor shall employ a Massachusetts licensed surveyor to provide the surveying functions necessary for the proper construction and documentation of the work.

- END OF SECTION -

MATERIALS AND PERFORMANCE - SECTION 02110

CLEARING AND GRUBBING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Under this section, the Contractor shall prepare and clear from the work site, by removal or destruction, as may be required, the following:

1. Pieces of rock up to 2 cubic yards in volume and large boulders
2. Trees and Bushes
3. Pavements
4. Brush/wood chips
5. Logs and Stumps
6. Refuse and Rubbish
7. Decayed and Growing Organic Matter
8. Concrete

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section MP-02200 - Earthwork
B. Section MP-02207 - Restoration of Surfaces
C. Section MP-02212 - Topsoil, Seeding and Mulch
D. Section MP-02222 - Soil Fill Materials

PART 2 - PRODUCTS

Not included.

PART 3 - EXECUTION

3.01 GENERAL

A. The Contractor shall furnish all labor, material, and equipment necessary to properly complete all work under this section.

B. Tree Protection

1. Any tree that shall not, in the opinion of GE or GE's Representative, hinder construction or landscaping shall be protected by stakes placed in a circle having a radius of not less than 5 feet as measured from the drip line (branch limit) around the tree. The stakes shall extend at least 4 feet above the existing ground. Each circle shall consist of at least 6 stakes.

MATERIALS AND PERFORMANCE - SECTION 02110

CLEARING AND GRUBBING

C. Debris Removal

1. All brush and trees shall be removed from the area, chipped or shredded, and disposed of at a location selected by GE for future use during consolidation activities, unless otherwise directed by GE.

3.02 ENVIRONMENTAL PROTECTION

A. Prohibited Construction Procedures

1. Prohibited construction procedures include, but are not limited to:

a. Dumping of spoil material into any wetlands, any surface waters, or at locations not specified for disposal by GE.

b. Indiscriminate, arbitrary or capricious operation of equipment in any stream corridors, any wetlands or any surface waters.

c. Pumping of silt-laden water from trenches or other excavations into any surface waters, any stream corridors or any wetlands.

d. Damaging vegetation beyond the extent necessary for construction of the consolidation area.

e. Disposal of trees, brush, and other debris in any wetlands, any surface waters or at unspecified locations.

B. Erosion and Sedimentation Control

1. Erosion control procedures, inclusive of mulching, shall be on site. Erosion control shall occur as required in accordance with Section 02233 entitled Silt Fencing, and the Technical Drawings. Controls shall be established prior to site and access clearing.

2. De-watering operations shall direct water that interferes with construction to an area approved by GE or GE's Representative, so as to allow sediment to settle out before such water enters any surface waters. Care should be taken not to damage or kill vegetation by excessive water or by damaging silt accumulation in the discharge area. Settling basins and silt fencing should be used upon GE or GE's Representative's direction, or as otherwise required to protect vegetation and to achieve environmental objectives.

C. Dust Control

1. Dust shall be controlled by water spray and sweeping on paved areas and by water spray on unpaved areas.

- END OF SECTION -

MATERIALS AND PERFORMANCE - SECTION 02200

EARTHWORK

PART 1 - GENERAL

1.01 DESCRIPTION

A. All labor, materials, services, and equipment necessary to complete the earthwork activities as depicted on the Technical Drawings and/or as directed by GE or GE's Representative.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section MP-02110 - Clearing and Grubbing
B. Section MP-02207 - Restoration of Surfaces
C. Section MP-02222 - Soil Fill Materials

1.03 SUBMITTALS

A. Contractor's proposed method(s) of compaction and equipment.

1.04 APPLICABLE CODES, STANDARDS AND SPECIFICATIONS

A. American Society for Testing and Materials (ASTM)

1.05 DEFINITION

A. Earthwork is defined to include, but is not limited to, clearing, pavement removal, rough grading, excavation for subgrades, trenching, handling and disposal of surplus materials, maintenance of excavations, removal of water, backfilling operations, embankments and fills, and compaction.

PART 2 - PRODUCTS

Specified elsewhere.

PART 3 - EXECUTION

3.01 UNAUTHORIZED EXCAVATION

A. The Contractor shall not be entitled to any compensation for excavations carried beyond or below the lines and subgrades prescribed in the Technical Drawings. The Contractor shall refill such unauthorized excavations at its own expense and in conformance with the provisions of this Section.

B. Should the Contractor, through negligence or for reasons of its own, carry its excavation below the designated subgrade, appropriate materials specified in MP Section 02222 - Soil Fill Materials shall be furnished and placed as backfill in sufficient quantities to reestablish the required subgrade surface. Soil fill materials used for backfilling shall be spread and compacted in conformance with the requirements of later subsections of this section, and to

the percentage compaction outlined therein. The cost of any tests required as a result of this refilling operation shall be borne by the Contractor.

C. All material which slides, falls, or caves into the established limits of excavations due to any cause whatsoever, shall be removed and disposed of at the Contractor's expense, and no extra compensation will be paid to the Contractor for any materials ordered for refilling the void areas left by the slide, fall, or cave-in.

3.02 BACKFILL MATERIALS

A. Soil fill material shall be used as specified for backfill, and when excavated material cannot be used as backfill. Requirements for off-site soil fill materials are specified in MP Section 02222 - Soil Fill Materials.

B. If the excavated material on site is approved in advance by GE or GE's Representative for reuse and as being suitable for filling or backfilling purposes, it shall be used.

C. On-site material is designated as "native fill" or "existing soil" material.

D. When on-site material is used, the Contractor shall remove all frozen material, boulders (over 6-inch diameter), trash, and debris, from such material prior to placement.

E. If it so elects, the Contractor may, at its own expense, substitute other types of material specified elsewhere in place of native fill material, provided such substitution is approved in advance by GE or GE's Representative and provided that all replaced material is disposed of as specified in the Contractor's Operations Plan.

3.03 GENERAL BACKFILLING REQUIREMENTS

A. Backfill shall be started at the lowest section of the area to be backfilled.

B. Drainage of the areas being backfilled shall be maintained at all times.

C. Areas to be backfilled shall be inspected prior to backfilling operations. All unsuitable materials and debris shall be removed.

D. Backfill material shall be inspected prior to placement and all roots, vegetation, organic matter, or other foreign debris shall be removed.

E. Stones larger than 6 inches in any dimension shall be removed or broken.

F. Stones shall not be allowed to form clusters with voids.

G. Backfill material shall not be placed when moisture content is too high to allow proper compaction.

MATERIALS AND PERFORMANCE - SECTION 02200

EARTHWORK

H. When material is too dry for adequate compaction, water shall be added to the extent necessary.

I. No backfill material shall be placed on frozen ground nor shall the material itself be frozen or contain frozen soil fragments when placed.

J. No calcium chloride or other chemicals shall be added to prevent freezing.

K. Material incorporated in the backfilling operation that is not in satisfactory condition shall be subject to rejection and removal at the Contractor's expense.

L. If the Contractor fails to stockpile and protect on-site excavated material acceptable for backfill, then the Contractor shall provide an equal quantity of acceptable off-site material at no expense to GE.

M. A minimum soil cushion of 24 inches (measured prior to compaction) shall be maintained between construction equipment and geosynthetics with the exception of backfill material placed over the geosynthetics anchor trench. For the anchor trench, a minimum soil cushion of 12 inches (measured after compaction) shall be maintained between construction equipment and geosynthetics.

N. With the exception of backfill placed directly over geosynthetics, the maximum lift thickness is 12 inches (measured prior to compaction).

O. Extreme care share shall be taken to avoid damaging geosynthetic materials during placement of soil material above the geosynthetics.

3.04 METHOD OF COMPACTION

A. General

1. The Contractor shall adopt compaction methods that shall produce the degree of compaction specified herein, prevent subsequent settlement, and provide adequate support.

2. Methods used shall avoid disturbance to underlying soils and to subsurface utilities.

3. Before filling or backfilling is begun, the Contractor shall submit in its Operations Plan the equipment and method for compaction that it proposes to use.

4. Hydraulic compaction by ponding or jetting shall not be permitted.

5. Backfill material shall not be left in an uncompacted state at the close of a day's construction.

MATERIALS AND PERFORMANCE - SECTION 02200

EARTHWORK

6. Prior to terminating work, the final layer of compacted fill, after compaction, shall be rolled with a smooth-drum roller if necessary to eliminate ridges of soil left by tractors, trucks, or other equipment used for compaction.

7. As backfill progresses, the surface shall be graded such that no ponding of water shall occur on the surface of the fill.

8. Fill shall not be placed on snow, ice, or soil that was permitted to freeze prior to compaction.

9. Unsatisfactory materials shall be removed prior to fill placement.

B. Equipment

1. Generally, equipment for compaction shall be the largest equipment consistent with space limitations of the work areas and the need to protect adjacent facilities and underlying materials.

2. Compaction of fill material in confined areas, such as the base liner anchor trench, shall be accomplished by means of a drum-type, power driven, hand-guided vibratory compactor, or by hand-guided vibratory plate tampers.

3. If the proposed method does not give the degree of compaction required, an alternate method shall be adopted until the required compaction is achieved.

4. The moisture content of backfill or fill material shall be adjusted, if necessary, to achieve the required degree of compaction.

C. Minimum Compaction Requirements

1. Unless specified otherwise on the Technical Drawings or in these specifications, the degree of compaction specified for the various items listed in Table 1 shall be the minimum allowable.

2. Unless the Contractor can successfully demonstrate that its methods shall produce the required degree of compaction, materials to be compacted shall be placed in layers not exceeding the uncompacted thicknesses listed in Table 1.

3. In-place density tests shall be required at a minimum of one test per each lift of backfill placed, at a frequency of 1 passing test per 2,500 square feet of subgrade, 100 cy of soil fill, or 100 linear feet of trench.

4. GE or GE's Representative may require additional in-place density tests to ascertain conformance with the compaction requirements shown on Table 1.

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EARTHWORK

5. The Contractor shall dig test holes at no additional cost to GE when requested for the purpose of taking an in-place density test below the current fill level.

6. The Contractor shall provide free access to trenches and fill areas to make such tests. Payment for these tests shall be made by the Contractor.

7. The Contractor shall anticipate time needed due to testing procedures and shall not have claims for extra compensation occasioned by such time.

8. Minimum field compaction requirements in Table 1 are expressed as a percentage of the maximum dry density of the material compacted using the Modified Proctor Compaction Test (ASTM D1557).

TABLE 1
MINIMUM COMPACTION REQUIREMENTS

Type of Backfill	Maximum Uncompacted Layer Thickness (Inches)	Minimum Compaction (Percent)
1. Subgrade – Native Soil	Not applicable	Proof-rolling
2. Liner Subbase (existing or native soil)	8	90
3. Embankments and Fills	12	90
4. Anchor Trench	12	90

9. Compaction curves for the full range of soil materials, including soil fill and existing soil, shall be developed by the Contractor.

10. Proof-rolling shall be performed prior to placing material over any existing (or native) soils.

11. When proof-rolling existing (or native) soils, the layer shall be acceptable when deformations caused by site equipment (e.g., roller, dump truck) are no deeper than one-inch. All soft or wet materials that continue to deform more than one-inch shall be removed and replaced with suitable material.

3.05 BACKFILL FOR ANCHOR TRENCHES

A. General

1. Anchor trench backfill shall be placed in 12-inch-thick loose lifts and thoroughly compacted by approved mechanical methods to ensure firm bedding. Refer to Table 1 for density requirements.

MATERIALS AND PERFORMANCE - SECTION 02200

EARTHWORK

3.06 BACKFILLING EMBANKMENTS AND EXCAVATIONS

A. General

1. Embankment areas shall be cleared and grubbed prior to initiating fill operations.

2. Embankments and excavations shall be formed or backfilled with satisfactory materials placed in successive layers, approximately horizontal, of not more than 12-inches in loose depth for the full width of the embankment or excavation.

3. All materials placed in constructing the embankment shall be free of organic matter, leaves, grass, roots, and other objectionable material.

4. At all times the Contractor shall slope the embankment to provide surface drainage.

5. The materials placed in the layers shall be of the proper moisture content to obtain the prescribed compaction.

6. Wetting or drying the material to secure a uniform moisture content throughout the layer may be required.

B. Compaction

1. Rolling operations shall be continued until the backfill is compacted to the density as specified in Subsection 3.04 (above) entitled Method of Compaction.

2. Any areas inaccessible to rollers shall be compacted by mechanical tampers.

3. In the construction of embankments, starting layers shall be placed in the deepest portion of the fill, and as placement progresses, layers shall be constructed approximately horizontal, maintaining drainage and keying layers into adjoining slopes.

4. The compaction equipment shall be of such design, weight, and quantity as to obtain the required density.

3.07 GRADING

A. After completing all fill and backfill operations, the Contractor shall grade the site to the lines, grades, and elevations shown on the Technical Drawings, taking into account any subsequent site restoration requirements.

MATERIALS AND PERFORMANCE - SECTION 02200

EARTHWORK

3.08 EXISTING FACILITIES

A. General

1. Existing subsurface facilities may be encountered during construction of the work, or located in close proximity to the work.

2. These facilities may include, but are not necessarily limited to, sewers, drains, water mains, conduits and their appurtenances. These facilities may not be shown on the Technical Drawings. However, the sizes, locations, and heights or depths (if indicated) are only approximate, and the Contractor shall conduct its operations with caution and satisfy itself as to the accuracy of the information given. The Contractor shall not claim nor shall it be entitled to receive compensation for damages sustained by reason of the inaccuracy of the information given or by reason of its failure to properly maintain and support such structures.

3. There may be other subsurface facilities, the existence and/or location of which are not known, such as individual water and gas services, electrical conduits, storm drains, etc. The Contractor shall consult with GE or GE's Representatives of such facilities and, if possible, shall determine, prior to construction, the location and depth of any such facilities that may exist in the area to be excavated.

4. If underground facilities are known to exist in an area but their location is uncertain, the Contractor shall exercise reasonable care in its excavation technique to avoid damage to them.

5. The Contractor shall notify Massachusetts DIGSAFE 72 hours prior to the start of site work and provide/perform required information/activities.

B. Notification and Protection Procedures

1. Except where superseded by state or local regulations, or in the absence of any applicable regulations, the Contractor shall, as a minimum, include the following procedures in its operations:

a. Prior to Excavating

1. Determine correct field location of all nearby underground facilities to arrange for Representatives of the utilities to locate them.

2. Notify owners of nearby underground facilities when excavating is to take place, allowing them reasonable time to institute precautionary procedures or preventive measures that they deem necessary to protect their facilities.

3. In cooperation with owners of nearby facilities, provide temporary support and protection of those underground facilities that may be especially vulnerable to damage by virtue of their physical condition or location, or those that could create hazardous conditions if damaged.

b. Immediately notify any utility owner of any damage to its underground facilities resulting from the Contractor's operations, and arrange for repairs to be made as soon as possible.

c. In case of an electrical short, or escape of gas or hazardous fluids (resulting from damage to an underground facility), immediately notify GE and all persons who might be endangered and assist in evacuation of people from the area.

3.09 OTHER REQUIREMENTS

A. Unfinished work

1. When, for any reason, the work is to be left unfinished, all excavations shall be filled and all roadways and watercourses left unobstructed with their surfaces in a safe and satisfactory condition. The surface of all roadways shall have temporary pavement.

B. Hauling Material on Street

1. When hauling material over the streets or pavement, the Contractor shall provide suitable tight vehicles so as to prevent deposits on the streets or pavements. In all cases where any materials are dropped from the vehicles, the Contractor shall clean up the same as often as required to keep the crosswalks, streets, and pavements clean and free from dirt, mud, stone, and other hauled material. Related activities shall be coordinated with GE or GE's representative.

2. When hauling materials that contain PCBs or other hazardous constituents, the Contractor shall abide by all applicable federal, state, and local codes, including, but not limited to, manifesting and placarding (if necessary). Related activities shall be coordinated with GE or GE's representative.

C. Dust Control

1. It shall be the sole responsibility of the Contractor to control the dust created by any and all of its operations to such a degree that it will not endanger the safety and welfare of the general public. Relater activities shall be performed in accordance with applicable Occupational Safety and Health Administration (OSHA) and Project Operations Plan (POP) requirements.

- END OF SECTION -

MATERIALS AND PERFORMANCE - SECTION 02207

RESTORATION OF SURFACES

PART 1 - GENERAL

1.01 DESCRIPTION

A. All types of surfaces disturbed, damaged, or destroyed while performing the work under or as a result of the operations of the Contract, shall be restored and maintained, as specified herein or as directed by GE or GE's Representative.

B. The quality of materials and the performance of work used in the restoration shall produce a surface or feature equal to or better than the condition of each before the work began, as approved by GE or GE's Representative.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section MP-02200 - Earthwork
B. Section MP-02212 - Topsoil, Seeding and Mulch
C. Section MP-02222 - Soil Fill Materials

1.03 SUBMITTALS

A. A schedule of restoration operations shall be submitted by the Contractor for review.

1.04 SCHEDULE OF RESTORATION

A. After an accepted schedule has been agreed upon, it shall be adhered to unless otherwise revised with the approval of GE or GE's Representative.

B. The replacement of surfaces at any time, as scheduled or as directed, shall not relieve the Contractor of responsibility to repair damages by settlement or other failures.

PART 2 - PRODUCTS

Specified elsewhere.

PART 3 - EXECUTION

3.01 STONE OR GRAVEL PAVEMENT

A. All pavement and other areas surfaced with stone or gravel shall be replaced with material to match the existing surface unless otherwise specified.

1. The depth of the asphalt or gravel shall be at least equal to the existing.

2. After compaction, the surface shall conform to the slope and grade of the area being replaced.

MATERIALS AND PERFORMANCE - SECTION 02207

RESTORATION OF SURFACES

3.02 LAWNS AND IMPROVED AREAS

A. The area to receive topsoil shall be graded to a depth of not less than 6 inches or as specified, below the proposed finish surface.

1. If the depth of existing topsoil prior to construction was greater than 6 inches, topsoil shall be replaced to that depth.

B. The furnishing and placing of topsoil, seed and mulch shall be as directed by GE or GE's Representative.

C. When required to obtain germination, the seeded areas shall be watered in such a manner as to prevent washing out of the seed.

D. Any washout or damage that occurs shall be regraded and reseeded until a good sod is established.

E. The Contractor shall maintain the newly seeded areas in good condition, including regrading, reseeding, watering, and mowing.

3.03 OTHER TYPES OF RESTORATION

A. Trees, shrubs, and landscape items inadvertently damaged or destroyed as a result of the construction operations shall be replaced in like species and size.

1. All planting and care thereof shall meet the standards of the American Association of Nurserymen.

B. Drainage structures, including culverts, manholes, catch basins, and piping, that are destroyed or removed as a result of the construction operations shall be replaced in like size and material, and shall be replaced at the original location and grade unless otherwise shown on the Technical Drawings. When there is minor damage to a culvert and with the consent of GE or GE's Representative, a repair may be undertaken, if satisfactory results can be obtained.

C. Fences destroyed or removed as a result of the construction operations shall be replaced in like size and material, and shall be replaced at the original location unless otherwise noted.

3.04 MAINTENANCE

A. The finished products of restoration shall be maintained in an acceptable condition for and during a period of one year following the date of Substantial Completion or other such date as set forth elsewhere in the Contract Documents.

- END OF SECTION -

MATERIALS AND PERFORMANCE - SECTION 02212

TOPSOIL, SEEDING AND MULCH

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work under this section consists of furnishing and placement of topsoil, fertilizer, seed, and mulch, and maintenance of seeded areas until final acceptance.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section MP-02200 - Earthwork
B. Section MP-02207 - Restoration of Surfaces

1.03 SUBMITTALS

A. Analysis of the seed (to demonstrate compliance with the seed mix identified in Section 2.01 of this specification) and fertilizer (to identify chemical composition), and proposed application rates (to demonstrate compliance with the fertilizer application rate identified in Section 3.01B of this specification).

B. Should hydroseed be used, the Contractor shall submit all data including material and application rates.

C. Location of source, and pH and organic content testing of off-site topsoil (if required).

D. Sample of topsoil to be tested by GE for chemical contaminants.

E. The name, location, and quantity of each source and type of soil fill material proposed by the Contractor including a sample of each source and soil fill type to be sampled for PCBs, volatile organic compounds (VOCs), Semi-VOCs, and metals. The results of the analyses will be compared to the appropriate regulatory levels. If such analyses indicate unacceptable chemical characteristics, GE will reject the use of fill materials from the proposed source(s), and the Contractor must identify and submit a sample(s) from another fill source. If a fill source is rejected by GE, analytical testing for one additional fill source will be performed at the expense of GE. If additional fill sources (more than two sources per fill material) are rejected, additional testing will be at the expense of the Contractor.

Soil sampling results previously submitted to, and approved by GE (within the last calendar year), for the proposed sources can be submitted to GE in lieu of additional testing. However, GE reserves the right to request additional verification testing prior to source approval.

MATERIALS AND PERFORMANCE - SECTION 02212

TOPSOIL, SEEDING AND MULCH

PART 2 - PRODUCTS

2.01 MATERIALS

A. Any off-site topsoil shall be unfrozen, friable, natural loam and shall be free of clay lumps, brush needs, litter, stumps, stones, and other extraneous matter. The topsoil shall have an organic content between 5% and 20%, and a pH between 5.5 and 7.5.

B. Fertilizer shall be a standard quality commercial carrier of available plant food elements. A complete prepared and packaged material containing a minimum of 5% nitrogen, 10% phosphoric acid and 10% potash.

1. Each bag of fertilizer shall bear the manufacturer's guaranteed statement of analysis.

C. Seed mixtures shall be of commercial stock of the current season's crop and shall be delivered in unopened containers bearing the guaranteed analysis of the mix.

1. All seed shall meet state standards of germination and purity.

D. Seed mix:

65%	Kentucky Blue Grass
20%	Perennial Rye Grass
15%	Fescue

E. The seed mix used on the interim cover shall be a quick-germinating rye grass.

F. Mulch shall be stalks of oats, wheat, rye, or other approved crops free from noxious weeds and coarse materials.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The topsoil shall be applied in a single loose lift of not less than six-inches. No compaction is required or allowed.

1. Following placement of topsoil and prior to fertilizer application, all stones greater than 1-inch in diameter, sticks, and other deleterious material shall be removed.

B. The fertilizer shall be applied to the surface uniformly at the rate of 20 pounds per 1,000 square feet.

1. Following the application of the fertilizer and prior to application of the seed, the topsoil shall be scarified to a depth of at least 2 inches with a disk or other suitable method traveling across the slope if possible.

MATERIALS AND PERFORMANCE - SECTION 02212

TOPSOIL, SEEDING AND MULCH

C. After the soil surface has been fine graded, the seed mixture shall be uniformly applied upon the prepared surface with a mechanical spreader at a rate specified by the seed manufacturer.

1. The seed shall be raked lightly into the surface.

2. Seeding and mulching shall not be done during windy weather.

D. The mulch shall be hand or machine spread to form a continuous blanket over the seed bed, approximately 2 inches in uniform thickness at loose measurement with a minimum of 90% surface coverage. Excessive amounts or bunching of mulch shall not be permitted.

1. Unless otherwise specified, mulch shall be left in place and allowed to decompose.

2. Any mulch that has not disintegrated at time of first mowing shall be removed.

E. Seeded areas shall be watered as often as required to obtain germination, and to obtain and maintain a satisfactory sod growth. Watering shall be performed in such a manner as to prevent washing out of seed and mulch.

F. Hydroseeding may be accepted as an alternative method of applying fertilizer, seed, and mulch. The Contractor must submit all data regarding materials and application rates to GE or GE's Representative for review.

3.02 MAINTENANCE

A. All erosion rills or gullies within the topsoil layer shall be filled with additional approved topsoil and graded smooth, and reseeded and mulched.

B. The Contractor shall also be responsible for repairs to all erosion of the seeded areas until all new grass is firmly established and reaches a height of not less than 4 inches. All bare or poorly vegetated areas must be reseeded and mulched.

- END OF SECTION -

MATERIALS AND PERFORMANCE - SECTION 02219

GEOSYNTHETIC DRAINAGE COMPOSITE

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall provide all labor, materials, tools, and equipment necessary to furnish and install geosynthetic drainage composite where specified in the Technical Drawings.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section MP-02232 - Geotextile Fabric
B. Section MP-02234 - Flexible Membrane Liner
C. The Construction Quality Assurance Plan – On-Plant Consolidation Areas (CQAP)

1.03 REFERENCES

A. American Society of Testing and Materials (ASTM);

1.	D1505-98	Specific Gravity
2.	D1238-01	Melt Flow Index
3.	D1603-01	Carbon Black Content
4.	D5199	Thickness
5.	D4716-01	Constant Head Transmissivity
6.	D5261	Weight
7.	D1777-96	Thickness
8.	D4632-91	Grab Tensile and Grab Elongation
9.	D4833-00	Puncture
10.	D4751-99a	A.O.S.
11.	D4533-98	Trapezoidal Tear
12.	D4491-99a	Water Flow Rate
13.	GRI GC7	Ply Adhesion

1.04 SUBMITTALS

A. Operational Submittals

1. Manufacturer's data for the geosynthetic drainage composite including physical properties and roll size.

2. Geosynthetic drainage composite material sample.

3. Manufacturer's quality assurance/quality control program.

4. Certified results of all quality control testing.

5. Contractor's proposed transportation, handling, and storage techniques.

6. Shop drawings, and proposed installation techniques.

MATERIALS AND PERFORMANCE - SECTION 02219

GEOSYNTHETIC DRAINAGE COMPOSITE

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Skaps Industries; or
B. Equal.

2.02 MATERIALS

A. The geosynthetic drainage composite shall be comprised of a high-density polyethylene (HDPE) drainage net composited with two, 6 oz/yd^2 non-woven geotextiles. The geotextiles shall be heat bonded to both sides of the drainage net.

1. The drainage net to be used in the composite shall be a profiled mesh made by extruding two sets of high density strands together to form a diamond shaped, three-dimensional net to provide planar fluid flow. The drainage net shall be made of HDPE containing carbon black, anti-oxidants, and heat stabilizers that shall be manufactured from resin provided from one resin supplier.

2. The geotextile shall be a non-woven, needle punched polymeric material.

B. The geosynthetic drainage composite shall meet the following specifications:

1. Drainage Net

Property	Test Method	Required Value
Specific Gravity (g/cm^3)	ASTM D1505	0.94 minimum
Melt Flow Index (g/10 min)	ASTM D1238 – Condition 190/2.16	1.0 maximum
Carbon Black Content (%)	ASTM D4218	2.0 minimum
Thickness (mil)	ASTM D5199	300 ± 30 minimum

2. Geotextile

Property	Test Method	Required Value (MARV)
Fabric Weight (oz/yd^2)	ASTM D5261	6.0
Grab Strength (lbs.)	ASTM D4632	150
Puncture Resistance (lbs.)	ASTM D4833	95
A.O.S. (U.S. Sieve)	ASTM D4751	70

MATERIALS AND PERFORMANCE - SECTION 02219

GEOSYNTHETIC DRAINAGE COMPOSITE

Property	Test Method	Required Value (MARV)
Water Flow Rate (gal/min/ft^2)	ASTM D4491	125

3. Composited Materials

Property	Test Method	Minimum Test Value
Transmissivity (m^2/s)	ASTM D4716*	2.13 x 10^{-3}
Ply Adhesion	GRI GC7	1.0

* Test methods to be performed with the following modifications:

Substrate Material:	60-Mil HDPE geomembrane
Superstrate Material:	Neoprene or 6-inches of representative soil
Applied Normal Compressive Load:	2,500 lbs/sq.ft.
Seating Time:	2 hours (minimum)
Hydraulic Gradient:	0.1

2.03 DELIVERY, STORAGE AND HANDLING

A. The geosynthetic drainage composite shall be packaged and shipped by appropriate means so as to prevent damage. Materials shall be delivered only after the required submittals have been received and reviewed by GE or GE's Representative.

B. The geosynthetic drainage composite shall be furnished in rolls, marked or tagged with the following information:

1. Manufacturer's Name
2. Product Identification
3. Lot/Batch Number
4. Roll Number
5. Roll Dimensions

C. The geosynthetic drainage composite shall be stored in an area approved by GE or GE's Representative that prevents damage to the product or packaging.

D. The geosynthetic drainage composite shall be kept clean and free from dirt, dust, mud, and any other debris.

E. Any geosynthetic drainage composite found to be damaged shall be replaced with new material at the Contractor's expense.

MATERIALS AND PERFORMANCE - SECTION 02219

GEOSYNTHETIC DRAINAGE COMPOSITE

2.04 QUALITY ASSURANCE

A. Field delivered material shall meet the specification values according to the manufacturer's specification sheet. The Contractor shall submit written certification that the delivered material meets the manufacturer's specifications. The Contractor shall submit to GE or GE's Representative certified quality control test results conducted by the manufacturer during the manufacturing of the geosynthetic drainage composite delivered to the project site. The results must identify the sections of field delivered geosynthetic drainage composite they represent. The Contractor shall also provide the lot and roll number for the material delivered to the site.

B. The manufacturer shall have developed and shall adhere to their own quality assurance program in the manufacture of the geosynthetic drainage composite.

C. The installer shall verify in writing prior to installation that the geosynthetic drainage composite has not been damaged due to improper transportation, handling, or storage.

D. Each of the installer's personnel shall have recorded 500,000 sf of successful material installation.

E. The Contractor shall provide shop drawings for indicating panel layouts and installation sequence.

PART 3 - EXECUTION

3.01 PREPARATION

A. The areas designated for placement of geosynthetic drainage composite shall be free from any deleterious material.

B. If the geosynthetic drainage composite is not clean before installation, it shall be washed by the Contractor until accepted by GE or GE's Representative.

3.02 INSTALLATION

A. Geosynthetic drainage composite shall be installed at locations shown on the Technical Drawings.

B. Adjacent rolls shall be installed so that the geonet component will have a minimum overlap of 4 inches.

C. The geonet shall be tied with plastic fasteners every 5 feet along the slope, every 6 inches on butt seams, and every 6 inches in the anchor trench.

D. The geotextiles shall be continuously sewn using a polymeric thread with chemical and ultraviolet resistance properties equal to or exceeding those of the geotextile.

MATERIALS AND PERFORMANCE - SECTION 02219

GEOSYNTHETIC DRAINAGE COMPOSITE

E. In the corners of the side slopes, where overlaps between rolls of nets are staggered, an extra layer of geosynthetic drainage composite shall be installed from the top to the bottom of the slope.

F. The geosynthetic drainage composite shall be unrolled downslope, keeping the net in slight tension to minimize wrinkles and folds.

G. If a tri-planar material is used, it must be installed in the appropriate flow direction.

H. Adequate loading shall be placed to prevent uplift by wind.

I. Holes or tears in the geosynthetic drainage composite shall be repaired in accordance with the manufacturer's recommendations/specifications.

3.03 QUALITY CONTROL

A. The Contractor shall provide as-built drawings identifying panel layout, locations or imperfections, and repairs and any other appropriate observations.

- END OF SECTION –

MATERIALS AND PERFORMANCE - SECTION 02222

SOIL FILL MATERIALS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Specified

1. Work under this section shall include, but not necessarily be limited to, supplying all labor and materials, excavating, transporting, dumping, spreading, and compacting Soil Fill Materials in the locations and to the depth shown on the Technical Drawings and/or as directed by GE or GE's Representative.

B. Applicable Standards and Specifications

1. American Society for Testing Materials (ASTM).

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section MP-02212 – Topsoil, Seeding and Mulch.
B. Section MP-02200 - Earthwork

1.03 SUBMITTALS

A. The name, location, and quantity of each source and type of soil fill material proposed by the Contractor including a sample of each source and soil fill type to be sampled for PCBs, volatile organic compounds (VOCs), Semi-VOCs, and metals. The results of the analyses will be compared to the appropriate regulatory levels. If such analyses indicate unacceptable chemical characteristics, GE will reject the use of fill materials from the proposed source(s), and the Contractor must identify and submit a sample(s) from another fill source. If a fill source is rejected by GE, analytical testing for one additional fill source will be performed at the expense of GE. If additional fill sources (more than two sources per fill material) are rejected, additional testing will be at the expense of the Contractor.

Soil sampling results previously submitted to, and approved by GE (within the last calendar year), for the proposed sources can be submitted to GE in lieu of additional testing. However, GE reserves the right to request additional verification testing prior to source approval.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Select fill shall be the type listed below:

Leachate Pipe Cover Aggregate

MATERIALS AND PERFORMANCE - SECTION 02222

SOIL FILL MATERIALS

1. Material placed above the leachate collection piping shall be washed, rounded run-of-bank gravel, with a d_{max} of 1 ½-inches and a d_{min} of 3/4-inches.

B. General Fill shall be the type listed below:

Subbase and Earthen Berms

1. Material to be used to construct the base liner system subbase and for the earthen berms (i.e., perimeter berms) shall be free of large (greater than 2-inches) objects, sticks, roots, or any other deleterious materials. Materials must provide a compacted, smooth, uniform surface free from any protruding objects that could damage the overlying FML. Materials must be capable of achieving the minimum compaction requirements presented in Section MP-02200.

PART 3 - EXECUTION

3.01 PLACEMENT

A. The entire surface to be covered with General Fill material shall be stripped of all grass, vegetation, topsoil, rubbish, or other unsuitable materials before backfilling.

B. In general, soil fill material shall be placed and compacted in horizontal layers no less than 3 inches and not exceeding those thicknesses indicated in Section MP-02200. The subgrade for placement of soil fill material shall be approved by GE or GE's Representative. Soil fill material shall not be placed on ground that shall not support the weight of construction equipment.

C. Each layer of soil fill material shall be thoroughly tamped or rolled to the required degree of compaction by mechanical tampers, or vibrators. Successive layers shall not be placed until the layer under construction has been thoroughly compacted.

D. Trucks or other heavy equipment shall not be operated over the fill layer until the minimum thickness of soil fill has been placed and properly compacted by tampers or other approved method.

E. Where required, the Contractor shall, at its own expense, moisture condition the fill to meet the compaction requirements. If, due to rain or other causes, the material is too wet for satisfactory compaction, it shall be allowed to dry or be removed as required, before compaction.

F. At the end of a day, the Contractor shall track the slope with a bulldozer perpendicular to the slope to help minimize erosion.

MATERIALS AND PERFORMANCE - SECTION 02222

SOIL FILL MATERIALS

3.02 FIELD TESTING AND QUALITY CONTROL

A. In-place density testing shall be performed by an independent testing laboratory at the Contractor's expense. Testing shall be performed in accordance with ASTM D2922. In-place density testing shall be as specified in the Section MP-02200.

3.03 CRITERIA AND TOLERANCES

A. Soil fill materials shall be constructed to such heights as to allow for post-construction settlement. Any settlements that occur before final acceptance of the Contract shall be corrected to make the backfill conform with the established lines and grades.

- END OF SECTION -

MATERIALS AND PERFORMANCE - SECTION 02232

GEOTEXTILE FABRIC

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall supply all labor, materials, tools, and equipment required to furnish and install geotextile fabric as specified herein and as shown on the Technical Drawings or as indicated by GE or GE's Representative.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM)

1.	D5261-92	Unit Weight
2.	D4632-91	Grab Tensile and Grab Elongation
3.	D3786	Mullen Burst
4.	D4833-00	Puncture
5.	D4533-91	Trapezoidal Tear
6.	D4355-99	Ultraviolet Resistance

1.03 SUBMITTALS

A. Manufacturer's data for geotextile including, at a minimum, physical properties, packaging, and installation techniques.

B. Manufacturer's quality assurance/quality control program.

C. Certified results of all quality control testing.

D. Contractor's proposed on-site transportation, handling, storage, and installation techniques.

E. Manufacturer's standard warranty provided for the geotextiles.

PART 2 - PRODUCT

2.01 ACCEPTABLE MANUFACTURERS

A. Skaps Industries;
B. Propex Fabrics; or
C. Equal.

2.02 MATERIALS

A. For these specifications and the Technical Drawings, the terms "geotextile" and "geotextile fabric" shall be considered synonymous.

MATERIALS AND PERFORMANCE - SECTION 02232

GEOTEXTILE FABRIC

B. Geotextile fabric to be used shall be of the types listed below:

Type 1: Non-Woven Geotextile, to be used for base liner construction
Type 2: Polypropylene Woven Geotextile stabilized to resist degradation due to ultraviolet exposure, to be used as protection geotextile above exposed geosynthetic drainage composite

C. The non-woven geotextile shall be of needle-punched construction and consist of long-chain polymeric fibers or filaments composed of polypropylene, shall be free of any chemical treatment that reduces permeability, and shall be inert to chemicals commonly found in soil.

D. The non-woven geotextiles indicated on the Technical Drawings shall have the minimum physical properties listed below:

Type 1: Non-Woven Geotextile

Property	Unit of Measure	Test Method	Minimum Test Value
Grab Tensile	lbs.	ASTM D4632	300
Grab Elongation	%	ASTM D4632	50
Mullen Burst	psi	ASTM D3786	580
Puncture	lbs	ASTM D4833	175
Trapezoidal Tear	lbs	ASTM D4533	115
UV Resistance	% Retained @ 500 hrs.	ASTM D4355	70
Unit Weight	oz./yd.^{2}	ASTM D5261	12

Type 2: Polypropylene Woven Geotextile

Property	Unit of Measure	Test Method	Minimum Test Value
Grab Tensile	lbs.	ASTM D4632	180
Mullen Burst	psi	ASTM D3786	305
Puncture	lbs	ASTM D4833	70
Trapezoidal Tear	lbs	ASTM D4533	70

MATERIALS AND PERFORMANCE - SECTION 02232

GEOTEXTILE FABRIC

2.03 DELIVERY, STORAGE AND HANDLING

A. The geotextile shall be furnished in a protective wrapping that shall be labeled with the following information: manufacturer's name, product identification, lot #, roll #, and dimensions.

B. The geotextile shall be protected from ultraviolet light, precipitation, mud, soil, excessive dust, puncture, cutting, and/or other damaging conditions prior to and during delivery and on-site storage. The geotextile shall be stored on-site at a location approved by GE or GE's Representative.

2.04 QUALITY ASSURANCE

A. The field-delivered fabric shall meet the specification values according to the manufacturer's specification sheet. The Contractor shall submit written certification that the delivered material meets the manufacturer's specifications. The Contractor shall provide the quality control test results conducted by the manufacturer during the manufacturing of the geotextile fabric delivered to the project site. The results shall identify the sections/panels of field-delivered fabric they represent. The Contractor shall also provide the lot and roll number for the fabric delivered to the site.

B. The manufacturer shall have developed and shall adhere to its own quality assurance program in the manufacture of the geotextile.

C. The installer shall verify, in writing and prior to installation, that the geotextile fabric has not been damaged due to improper transportation, handling, or storage.

PART 3 - EXECUTION

3.01 PREPARATION

A. Prior to installing the geotextile, placement surfaces shall be leveled and uniformly compacted, as necessary, to provide a stable interface for the geotextile that is as smooth as possible.

3.02 GEOTEXTILE INSTALLATION

The following procedures and requirements will be followed during the geotextile installation.

A. Placement

1. Placement of the geotextile shall not be conducted during adverse weather conditions. The geotextile shall be kept dry during storage and up to the time of deployment. During windy conditions, all geotextiles shall be secured with sandbags or an equivalent approved anchoring system. Removal of the sandbags or equal shall only occur upon placement of an overlying soil layer. Sandbags will remain on the

MATERIALS AND PERFORMANCE - SECTION 02232

GEOTEXTILE FABRIC

Type 2 geotextile as necessary to ensure complete coverage of underlying geosynthetic drainage composite during adverse weather conditions.

2. Proper cutting tools shall be used to cut and size the geotextile materials. Extreme care shall be taken while cutting geotextiles.

3. During the placement of geotextiles, all dirt, dust, sand, and mud shall be kept off to prevent clogging. If excessive containment materials are present on the geotextile, it shall be cleaned or replaced as directed by GE or GE's Representative.

4. The Type 1 geotextile shall be covered within the time period recommended by the manufacturer, and in no case later than two weeks after its placement.

5. In all cases, seams on sideslopes shall be parallel to the line of slope. No horizontal seams shall be allowed on side slopes.

B. Seaming and Repairing

1. Geotextiles shall be continuously sewn using a polymeric thread with chemical and ultraviolet resistance properties equal to or exceeding those of the geotextile.

2. Repair of tears or holes in the geotextile shall require the following procedures:

a. On slopes: A patch made from the same geotextile shall be double seamed into place; with each seam 1/4-inch to 3/4-inch apart and no closer than 1 inch from any edge. Should any tear exceed 10% of the width of the roll, that roll shall be removed from the slope and replaced.

b. Non-slopes: A patch made from the same geotextile shall be spot-seamed in place with a minimum 24-inch overlap in all directions.

3.03 POST-CONSTRUCTION

A. Upon completing the installation, the Contractor shall submit to GE or GE's Representative:

1. All quality control documentation and the as-built panel drawings.

3.04 WARRANTY

A. The Contractor shall obtain from the manufacturer and submit to GE or GE's Representative, a standard warranty provided for the geotextiles.

- END OF SECTION -

MATERIALS AND PERFORMANCE - SECTION 02233

SILT FENCING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The Contractor shall supply all labor, materials, tools, and equipment required to furnish and install silt fencing as specified herein and as shown on the Technical Drawings, or as directed by GE or GE's Representative.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. D4632 Grab Tensile and Grab Elongation
2. D3786 Mullen Burst
3. D4833 Puncture
4. D4355-99 Ultraviolet Resistance
5. D4751 Apparent Opening Size

1.03 SUBMITTALS

A. Manufacturer's data for geotextile including, at a minimum, physical properties, and packaging.

B. Manufacturer's quality assurance/quality control program.

C. Certified results of all quality control testing.

PART 2 - PRODUCT

2.01 ACCEPTABLE MANUFACTURERS

A. Skaps Industries;
B. Propex Fabrics; or
C. Equal.

2.02 MATERIALS

A. The silt fencing shall consist of long-chain polymeric fibers or filaments composed of polypropylene.

B. The silt fencing shall be free of any chemical treatment that reduces permeability and shall be inert to chemicals commonly found in soil.

C. The silt fencing indicated on the Technical Drawings shall have the minimum physical properties listed below:

MATERIALS AND PERFORMANCE - SECTION 02233

SILT FENCING

Property	Unit of Measure	Test Method	Value
Grab Tensile	lbs.	ASTM D4632	80
Grab Elongation	%	ASTM D4632	15
Mullen Burst	psi	ASTM D3786	250
Puncture	lbs	ASTM D4833	30
Apparent Opening Size	US Sieve Number	ASTM D4751	#10 Sieve
UV Resistance	%	ASTM D4355	70 @ 500 hrs

2.03 DELIVERY, STORAGE AND HANDLING

A. The silt fencing shall be furnished in a protective wrapping that shall be labeled with the following information: manufacturer's name, product identification, lot #, roll #, and dimensions.

2.04 QUALITY ASSURANCE

A. The field-delivered fabric shall meet the specification values according to the manufacturer's specification sheet. The Contractor shall submit written certification that the delivered fabric meets the manufacturer's specifications. The Contractor shall provide the quality control test results conducted by the manufacturer during the manufacturing of the silt fencing delivered to the project site. The results shall identify the sections/panels of field-delivered fabric they represent. The Contractor shall also provide the lot and roll number for the material delivered to the site.

B. The manufacturer shall have developed and shall adhere to its own quality assurance program in the manufacture of the silt fencing.

C. The installer shall verify in writing prior to installation that the silt fencing has not been damaged due to improper transportation, handling, or storage.

PART 3 - EXECUTION

3.01 SILT FENCING INSTALLATION

A. The silt fencing shall be installed as depicted on the Technical Drawings and in conformance with the manufacturer's recommendations.

3.02 WARRANTY

A. The Contractor shall obtain from the manufacturer and submit to GE or GE's Representative, a standard warranty provided for the geotextiles.

- END OF SECTION -

MATERIALS AND PERFORMANCE - SECTION 02234

FLEXIBLE MEMBRANE LINER

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Specified

1. Under this section, the Contractor shall furnish and install 60-mil thick, textured high-density polyethylene (HDPE) Flexible Membrane Liner (FML) material as shown on the Technical Drawings, and as specified herein and/or directed.

2. The Contractor shall be responsible for all Quality Assurance/Quality Control (QA/QC) testing specified herein and as indicated on the Technical Drawings. All QA/QC testing, with the exception of non-destructive tests, shall be conducted by an independent laboratory at the Contractor's expense.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section MP-02219 - Geosynthetic Drainage Composite
B. Section MP-02232 - Geotextile Fabric

1.03 APPLICABLE CODES, STANDARDS, SPECIFICATIONS, AND PUBLICATIONS

A. American Society for Testing and Materials (ASTM)

1. D6693 Tensile Properties of Plastics
2. D1505/792 Specific Gravity and Density of Plastics by Displacement
3. D1004-94a Initial Tear Resistance of Plastic Film and Sheeting
4. D1505-98 Density of Plastics by the Density Gradient Technique
5. D1603-01 Carbon Black in Olefin Plastics
6. D5397-99 Environmental Stress-Cracking of Ethylene Plastics
7. D5994-98 Core Thickness of Textured Geomembrane
8. D5596-94 Microscopical Examination of Pigment Dispersion in Plastic Compounds
9. D4833-97 Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
10. D1603 Carbon Black Content

B. Geosynthetic Research Institute (GRI)

MATERIALS AND PERFORMANCE - SECTION 02234

FLEXIBLE MEMBRANE LINER

GRI Test Method GM 13	Test Properties, Testing Frequencies and Recommended Warrant for High-Density Polyethylene (HDPE) Smooth and Textured Geomembranes

C. Where reference is made to one of the above codes, standards, specifications, or publications the revisions in effect at the time of bid shall apply.

1.04 QUALIFICATIONS

A. FML Manufacturer

1. The Contractor shall submit to GE or GE's Representative for approval the following information regarding the FML Manufacturer:

a. Corporate background and information.

b. Manufacturing capabilities including:

- Quality control procedures for manufacturing; and
- List of material properties including certified test results, to which FML samples are attached.

c. A list of at least 10 completed facilities, totaling a minimum of 10,000,000 ft^2, for which the Manufacturer has manufactured FMLs. For each facility, the following information shall be provided:

- Name and purpose of facility, its location, and date of installation;
- Name of Owner, Project Manager, Designer, Fabricator (if any), and Installer; and
- Thickness of FML, surface area of FML manufactured.

d. Origin (resin supplier's name, resin production plant) and identification (brand name, number) of the resin.

B. Installer

1. The Installer must be trained and approved and/or licensed by the FML Manufacturer for the installation of FML.

2. The Contractor shall submit to GE or GE's Representative for approval the following written information, relative to the Installer:

a. Copy of Installer's letter of approval or license by the Manufacturer.

MATERIALS AND PERFORMANCE - SECTION 02234

FLEXIBLE MEMBRANE LINER

b. Resume of the "master seamer" to be assigned to this project, including dates and duration of employment.

3. All personnel performing seaming operations shall be qualified by experience or by successfully passing seaming tests. At least one seamer shall have experience seaming a minimum of 1,000,000 ft^2 of FML of the type for this project, using the same type of seaming apparatus in use at the site.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Solmax Geosynthetics;
B. PolyFlex; or
C. Equal.

2.02 MATERIALS

A. HDPE Lining Material Specifications

1. HDPE FML material shall meet the following minimum specification values listed below and as listed in GRI GM13.

Property	Test Method	Specification Limit (MARV)
		60 mil Textured
HDPE FML Resin		
Specific Gravity (min.)	ASTM D1505/D792	.940
Carbon Black Content	ASTM D1603/D4218	2.0 - 3.0%
Carbon Black Dispersion	ASTM D5596	1, 2 or 3 category All 10 views
HDPE FML Rolls		
Thickness (nominal)	ASTM D5994	60 mil
Thickness (min. avg.)		57 mil
lowest individual 8 of 10 values		54 mil
lowest individual of 10 values		51 mil

MATERIALS AND PERFORMANCE - SECTION 02234

FLEXIBLE MEMBRANE LINER

Property	Test Method	Specification Limit (MARV) 60 mil Textured
Density (min.)	ASTM D1505/D792	.940
Tensile Properties		
Tensile Strength at Break (min.)	ASTM D638 Type IV	90 ppi
Tensile Strength at Yield (min.)		126 ppi
Elongation at Break (min.)		100%
Elongation at Yield (min.)		12%
Tear Resistance (min.)	ASTM D1004	42 lbs
Puncture Resistance (min.)	ASTM D4833	90 lbs
Stress Crack Resistance	ASTM D5397	200 Hour

B. Welding Material

1. The resin used in the welding material must be identical to the liner material.

2. All welding materials shall be of a type recommended and supplied by the manufacturer and shall be delivered in the original sealed containers, each with an indelible label bearing the brand name, manufacturer's mark number, and complete directions as to proper storage.

C. Labeling FML Rolls

1. Labels on each roll or factory panel shall identify the following:

- Thickness of the material;
- Length and width of the roll or factory panel;
- Manufacturer;
- Directions to unroll the material;
- Product identification;
- Lot number; and
- Roll or field panel number.

MATERIALS AND PERFORMANCE - SECTION 02234

FLEXIBLE MEMBRANE LINER

2.03 DELIVERY, HANDLING, AND STORAGE

A. The Contractor shall be liable for all damages to the materials incurred prior to and during transportation to the site.

B. Handling, storage, and care of the FML prior to and following installation at the site is the responsibility of the Contractor. The Contractor shall be liable for all damages to the materials incurred prior to final acceptance of the lining system by GE or GE's Representative.

C. The Contractor shall notify GE or GE's Representative of the anticipated delivery time.

2.04 ADDITIONAL SUBMITTALS

A. The Contractor shall submit the following items for approval at least one week prior to installation:

1. Shop drawings that shall include:

a. Layout plan;

b. Quality control program manuals covering all phases of manufacturing and installation; and

c. Complete and detailed written instructions for the storage, handling, installation, seaming, inspection plan fail criteria for liner inspections, and QA/QC testing procedures of the liner in compliance with these specifications and the condition of its warranty.

PART 3 - EXECUTION

3.01 FML INSTALLATION

A. Related Earthwork

1. The Contractor shall ensure that all related earthwork requirements under this section are complied with:

a. The FML installations shall be performed on a firm, smooth, soil or geotextile-covered surface free from stones or protruding objects.

b. No FML shall be placed onto an area that has become softened by precipitation. Appropriate methods of moisture control are the responsibility of the Contractor.

c. No FML shall be placed on frozen soil material. Such material shall be removed and replaced with new soil fill as specified in the Section MP-02222 - Soil Fill Materials.

d. The FML Installer shall certify in writing that the final surface on which the FML is to be installed is acceptable.

e. All surfaces on which the FML is to be installed shall be acceptable to GE or GE's Representative prior to FML installation.

f. Free edges of FML shall be secured so as to prevent uplift by wind or the intrusion of water under the liner. Edge protection shall include sandbags, polyethylene sheeting, or other methods as deemed necessary by the Contractor and approved by GE or GE's Representative.

g. The FML shall be anchored within an anchor trench constructed to the dimensions shown in the Technical Drawings. Care shall be taken while backfilling the trenches to prevent damage to the FML.

B. FML Deployment

1. FML shall be deployed according to the following procedures:

a. Placement of the FML panels shall be according to the approved location and position plan provided by the Installer. Placement shall follow all instructions on the boxes or wrapping containing the FML materials that describe the proper methods of unrolling panels.

b. The method of placement must ensure that:

- Deployed FML must be visually inspected for uniformity, tears, punctures, blisters, or other damage or imperfections. Any such imperfections shall be immediately repaired and reinspected.

- No equipment used shall damage the FML by handling, trafficking, leakage of hydrocarbons, or other means.

- No personnel working on the FML shall smoke, wear damaging shoes, or engage in other activities that could damage the FML.

- The prepared surface underlying the FML must not be allowed to deteriorate after acceptance, and must remain acceptable up to the time of FML placement and until completion of the project.

- Adequate temporary loading and/or anchoring (e.g., sand bags), not likely to damage the FML, shall be placed to prevent uplift by wind (in case of high winds, continuous loading is recommended along edges of panels to minimize risk of wind flow under the panels).

- Direct contact with the FML shall be minimized (i.e., the FML in excessively high-traffic areas shall be protected by geotextiles, extra FML, or other suitable materials).

c. Any damage to the FML panels or portions of the panels as a result of placement must be replaced or repaired at no cost to GE or GE's Representative. The decision to replace or repair any panel or portions of panels shall be made by GE or GE's Representative.

d. The Installer shall assign an "identification number" to each FML panel placed. The number system used shall be simple, logical, and shall identify the relative location in the field.

C. Seaming

1. The seaming procedures below shall be implemented, where applicable, during installation of the FML. The seaming procedures are as follows:

a. Generally, all seams whether field or factory, shall be oriented parallel to the line of slope, not across slope. At liner penetrations and corners, the number of seams shall be minimized.

b. The area of the FML to be seamed shall be cleaned and prepared according to the procedures specified by the material manufacturer. Any abrading of the FML shall not extend more than one-half inch on either side of the weld. Care shall be taken to eliminate or minimize the number of wrinkles and "fishmouths" resulting from seam orientation.

c. Field seaming is prohibited when either the air or sheet temperature is below 32°F, or when the sheet temperature exceeds 122°F, or when the air temperature is above 104°F. At air or sheet temperatures between 32°F and 40°F, seaming shall be conducted directly behind a preheating device. In addition, seaming shall not be conducted when FML material is wet from precipitation, dew, fog, etc., or when winds are in excess of 20 miles per hour.

d. Seaming shall not be performed on frozen or excessively wet underlying soil surfaces.

e. Seams shall have an overlap beyond the weld large enough to perform destructive peel tests, but shall not exceed 5 inches.

f. The Contractor shall perform trial seams on excess FML material. A 1-foot by 3-foot seamed liner sample shall be fabricated with the seam running down the 3-foot length in the center of the sample. Such trial seaming shall be conducted prior to the start of each seaming succession for each seaming crew, change in machine or every 4 hours, after any significant change in weather conditions or FML temperature, or after any change in seaming equipment. From each trial seam, four field test specimens shall be taken. The test specimens shall be 1-inch by 12-inch strips cut perpendicular to the trial seam. Two of these specimens shall be shear tested and two shall be peel tested using a field tensiometer, and recorded as pass (failure of liner material) or fail (failure of seam). Upon initial failure, a second trial seam shall be made; if both trial seams fail, then the seaming device and its operator shall not perform any seaming operations until the deficiencies are corrected and two successive passing trial seams are produced. Completed trial seam samples cannot be used as portions of a second sample and must be discarded.

g. Where fishmouths occur, the material shall be cut, overlapped, and an overlap weld shall be applied. Where necessary, patching using the same liner material shall be welded to the FML sheet.

h. Acceptable seaming methods for FML are:

- Extrusion welding using extrudate with identical physical, chemical, and environmental properties; and
- Hot wedge welding using a proven fusion welder and master seamer.

i. Seaming device shall not have any sharp edges that might damage the FML. Where self-propelled seaming devices are used, it shall be necessary to prevent "bulldozing" of the device into the underlying soil.

D. Seam Testing

1. The Contractor shall perform nondestructive seam testing on 100 percent of field seams. The following test method and procedures may be used:

a. Air pressure testing may be used if double-track hot-wedge welding has been used to seam the HDPE FML. Using approved pressure testing equipment, the following procedures will be followed:

- Seal both ends of the air channel separating the double-track hot-wedge welds;
- Insert pressure needle into air channel and pressurize the air channel to 27 psi;
- Monitor pressure gauge for 3 minutes and determine whether pressure is maintained without a loss of more than 2 psi; and

- If the pressure test fails, then localize the leak and mark the area for repair.

Air pressure testing will be conducted under the direct observation of GE or GE's Representative.

b. Vacuum testing will be used on all seams not tested using air pressure testing. Using an approved vacuum box, the following procedures will be followed:

- Apply a soapy water mixture over the seam;
- Place vacuum box over soapy seam and form a tight seal;
- Create a vacuum by reducing the vacuum box pressure to 5 psi for 10 seconds;
- Observe through the vacuum box window any bubbles;
- Where bubbles are observed, mark seam for repair;
- Move vacuum box further down seam overlapping tested seam by 3 inches; and
- Where hot-wedge seaming has been performed, the overlap must be cut back to the weld.

All vacuum testing will be conducted under the direct observation of GE or GE's Representative.

2. In addition to nondestructive seam testing, the Contractor will perform destructive testing. The destructive testing procedures are as follows:

a. Test samples will be prepared by the Installer every 500 feet of seam length, a minimum of one test for each seaming machine per day, or more frequently at the discretion of GE or GE's Representative. Sample location and size will be selected by GE or GE's Representative. The sample size (12 x 56 inches) will be large enough to produce three sets of test specimens for the following tests:

- Seam Shear Strength, ASTM D6392; and
- Peel Adhesion, ASTM D6392.

b. Ten specimens will compose a set. Five of these will be tested for peel and the other five for shear strength. Each specimen will be 1-inch wide and 12-inches long with the field seam at the center of the specimen. The 56-inch sample length will first be cut at the ends to produce two field peel test specimens. The remaining 54 inches will be divided up into thirds and one-third submitted to the Contractor, one-third to the independent testing laboratory, and one-third to GE or GE's Representative for storage and future reference.

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FLEXIBLE MEMBRANE LINER

c. Test specimens will be considered passing if the minimum values below are met or exceeded for four of the five test specimens tested by the independent laboratory. All acceptable seams will lie between two locations where samples have passed.

d. The cost of destructive testing will be borne by the Contractor.

e. Seams will meet the following minimum specification values listed below and as listed in GRI Test Method GM19:

Field Seam Properties	Specification Limit	Test Method
Shear Strength at Yield (lb/in width)	120 ppi	ASTM D6392
Peel Adhesion – Fusion	91 ppi and Film tear bond	ASTM D6392
Peel Adhesion - Extrusion	78 ppi and Film tear bond	ASTM D6392

3. If a sample fails destructive testing, the Contractor shall ensure that: the seam is reconstructed in each direction between the location of the sample that failed and the location of the next acceptable sample; or the welding path is retraced to an intermediate location at least 10 feet in each direction from the location of the sample that failed the test, and a second sample is taken for an additional field test. If this second test sample passes, the seam must be then reconstructed between the location of the second test and the original sampled location. If the second sample fails, the process must be repeated.

   All costs for work performed to achieve passing tests along with costs for retesting will be borne by the Contractor.

4. If double-track hot-wedge welding is used, GE or GE's Representative and the Installer must agree on the track weld that will be used in the destructive testing. The weld chosen inside or outside must be consistently tested, and must pass according to the criteria above.

5. All holes created by cutting out destructive samples will be patched by the Contractor immediately with an oval patch of the same material welded to the membrane using extrusion welding. The patch seams will be tested using a vacuum box and using the procedures described above. Work will not proceed with materials covering the FML until passing results of destructive testing have been achieved.

6. At the ends of each field seam, two field test specimens will be taken and field tested with a field tensiometer. Both specimens must pass prior to placing the membrane in the anchor trench or continuing with additional seams. Failure of these specimens

will require correcting the seaming device and repair of the preceding seam according to the failure testing and procedures described above.

E. Liner Repair

1. All imperfections, flaws, construction damage, and destructive and nondestructive seam failures shall be repaired by the Installer of the FML. The appropriate methods of repair are listed below:

- Patching, used to repair holes, tears, undispersed raw materials, and contamination by foreign matter;
- Grinding and rewelding, used to repair small sections of extruded seams;
- Spot welding or seaming, used to repair pinholes or other minor, localized flaws;
- Capping, used to repair large lengths of failed seams;
- Topping, used to repair areas of inadequate seams which have an exposed edge; and
- Removing bad seams and replacing with a strip of new material welded into placed, used with large lengths of fusion seams.

F. Construction Material Placement and Penetrations

1. Wrinkles that develop from normal placement procedures must be controlled such that the underlying FML does not fold over. Small wrinkles, defined as having their height less than or equal to one-half their base width, may be trapped and pushed down by the overlying soil. Any wrinkle that becomes too large and uncontrollable or that folds the FML over must be brought to the attention of GE or GE's Representative. If necessary, the FML shall be uncovered, cut, laid flat, seamed by extrusion welding, and non-destructively tested.

3.02 POST-CONSTRUCTION

A. The Installer of the FML materials shall prepare and the Contractor shall submit to GE or GE's Representative, record drawings illustrating the following information:

- Dimensions of all FML field panels;
- Panel locations referenced to the Technical Drawings;
- All field seams and panels with the appropriate number or code; and
- Location of all patches, repairs, and destructive testing samples.

3.03 WARRANTY

A. The Contractor shall obtain and submit to GE or GE's Representative from the Manufacturer a standard warranty provided for the FML.

- END OF SECTION -

MATERIALS AND PERFORMANCE - SECTION 02271

RIPRAP

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Under this section, the Contractor shall furnish all labor, equipment, and materials, and shall perform all work necessary to place a protective covering of erosion-resistant riprap at locations shown on the Technical Drawings or as directed by GE or GE's Representative. The work shall be done in accordance with these specifications and in conformity with the lines and grades shown on the Technical Drawings.

1.02 SUBMITTALS

A. Particle size distribution of all proposed riprap types.

B. Proposed sources of riprap and amount of available material at each source.

PART 2 - PRODUCTS

2.01 RIPRAP

A. Stone used for riprap shall be hard; durable; angular in shape; resistant to weathering and to water action; free from overburden, spoil, shale and organic material; and shall meet the gradation requirements for the type specified. Neither breadth nor thickness of a single stone should be less than one-third its length. Rounded stone or boulders shall not be accepted unless authorized by GE or GE's Representative. Shale and stone with shale seams are not acceptable.

B. The sources from which the stone shall be obtained shall be selected by the Contractor for approval by GE or GE's Representative well in advance of the time the stone shall be required in the work. The acceptability of the stone shall be determined by service records and/or by suitable tests, as required by GE or GE's Representative. If testing is required, suitable samples of stone shall be taken in the presence of GE or GE's Representative prior to mobilization to the site. The approval of some rock fragments from a particular quarry site shall not be construed as constituting the approval of all rock fragments taken from that quarry.

C. The sizes of riprap to be provided shall be the following:

Type	Maximum Stone Size (dmax)	d50
1	6"	4"

Each load of riprap shall be reasonably well graded from the smallest to the maximum size specified.

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RIPRAP

D. In addition to meeting the gradation requirements set forth in this section for the type of riprap indicated, riprap shall consist of stones shaped as nearly as practicable in the form of right rectangular prisms.

PART 3 - EXECUTION

3.01 PLACEMENT

A. Slopes or ditches to be protected by riprap shall be free of brush, topsoil, trees, stumps, and other objectionable material and shall be dressed to a smooth surface. All soft or spongy material shall be removed as directed by GE or GE's Representative and replaced with approved material and compacted as specified.

B. Stone for riprap shall be placed on the prepared slopes and surfaces in a manner that shall produce a reasonably well-graded mass of stone with the minimum practicable percentage of voids. The entire mass of stone shall be placed so as to be in conformance with the lines, grades, and thicknesses shown on the Technical Drawings. Riprap shall be placed to its full course thickness in one operation and in such a manner as to avoid displacing the underlying material. Placing of riprap in layers, or by dumping into chutes, or by similar methods likely to cause segregation shall not be permitted.

C. The larger stones shall be well distributed. All material going into riprap protection shall be so placed and distributed such that there are no large accumulations of either the larger or smaller sizes of stone.

D. Hand placing or rearranging of individual stones by mechanical equipment may be required to the extent necessary to secure the results specified.

E. Unless otherwise authorized by GE or GE's Representative, the riprap protection shall be placed in continuous progression with the construction of the embankment. The Contractor shall maintain the riprap protection until accepted, and any material displaced by any cause shall be replaced to the lines and grades shown on the Technical Drawings at no additional cost to GE.

F. Riprap shall be placed so that the dimension approximately equal to the layer thickness is perpendicular to the slope surface, and so that the weight of the stone is carried by the underlying material and not by the adjacent stones. On slopes, the largest stones shall be placed at the bottom of the slope. The riprap shall be properly aligned and placed so as to minimize void spaces between adjacent stones. The spaces between the stones shall be filled with spalls of suitable size.

G. All sediment deposited within the riprap following installation shall be promptly removed by the Contractor.

- END OF SECTION -

MATERIALS AND PERFORMANCE - SECTION 02526

HIGH-DENSITY POLYETHYLENE PIPE

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Under this section, the Contractor shall furnish all labor, materials, and equipment required to install single-wall high-density polyethylene pipe, including leachate collection lines and cleanouts, as shown on the Technical Drawings, as specified herein, and/or as directed by GE or GE's Representative.

1.02 QUALITY ASSURANCE AND SUBMITTALS

A. The Contractor shall submit to GE or GE's Representative all applicable data demonstrating compliance with the provisions of the Technical Drawings and these Specifications.

B. All piping shall be inspected upon delivery to the site. Materials not in compliance with the specifications shall be removed and replaced by the Contractor at no expense to GE. The Contractor shall furnish all labor required to handle the pipe during the inspection.

C. Resumes of certified pipe welders.

D. Shop drawings including, but not limited to, the following:

1. Pipe material specifications.
2. Pipe jointing techniques and procedures.
3. Pipe and fitting details.
4. Manufacturer's installation guides.

PART 2 - PRODUCTS

2.01 MATERIAL

A. All pipes and fittings shall be of smooth interior and exterior, and shall be composed of high-density, high-molecular-weight material using PE3408-grade resin having a cell classification in the following range (from ASTM D-3350).

Property Designation	Property	Cell Classification Limits
1	Density	3
2	Melt Index	3-5
3	Flexural Modulus	4-5
4	Tensile Strength at Yield	4-5
5	Environmental Stress Cracking Resistance	3
6	Hydrostatic Design Basis	4

MATERIALS AND PERFORMANCE - SECTION 02526

HIGH-DENSITY POLYETHYLENE PIPE

Property Designation	Property	Cell Classification Limits
7	UV Color Code	C

B. All HDPE pipe and fittings shall conform to ASTM D-3350.

C. All single-wall HDPE pipe and fittings shall have an SDR 17 as specified on the Technical Drawings.

D. The pipe shall be free of blisters, foreign inclusions, cracks, or other defects. The pipe shall be uniform as much as practicable in all physical properties. Defective pipe shall be removed from the job site.

E. HDPE end caps should be supplied and installed where shown on the Technical Drawings.

F. Acceptable manufacturers shall be Phillips 66 or equal.

1. Acceptable products shall be Driscopipe 1000 series or equal.

2.02 PERFORATIONS

A. Perforations shall be as shown on the Technical Drawings.

2.03 JOINTS

A. Shavings or burrs shall not be permitted on the pipe interior surface. Joints shall be of the butt-fusion (thermo-weld) type.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation of all HDPE pipe and associated fittings shall conform with the manufacturer's installation standards and be completed by individuals certified for such work.

B. Where necessary, the Contractor shall be required to field fabricate joints to ensure proper fit and alignment.

- END OF SECTION -